Volume 60

American Machinist

Number 6

New York, February 7, 1924

Drilling Motor Parts on the Rotating Table

By W. F. Sandmann

Examples of rotating fixtures used on a large variety of automotive work—Construction of fixtures and the principles involved in design

HARDLY an accessory to a machine tool offers greater opportunities for increasing production than does the rotating work-table used in connection with the multiple drilling machine. The automobile manufacturers were among the first to realize its worth and within the last three or four years its use has played an important part in the decreasing of costs in plants all over the country.

The first rotating tables placed on the market by several of the tool builders were crude affairs requiring strong operators to even rotate them from position to position and were sometimes more of a detriment than an aid to production. These tables were discarded in favor of ones that floated on a number of rollers. Such tables were much easier to swing but the rollers had a persistent habit of getting out of alignment allowing the tables to become wobbly and were in turn superseded by the present type which seem to have solved all the difficulties presented in the earlier designs. The operator now has merely to exert a few pounds pressure on a convenient pedal and the table is raised a fraction of an inch, resting on a large ball bearing under the center. The table can then be swung without effort, even when loaded with hundreds of pounds of fixtures and parts. Releasing the pedal lowers the ball bearing and the table sinks back on to wide solid ways.

With a satisfactory type of table offered by the machine builders, it was up to the manufacturers to devise fixtures that would make the most of the opportunities for lowering costs by its use.

How one manufacturer solved the drilling problem presented by the flange-bolt holes in forged hubs for truck wheels is shown in Fig. 1. When drilling these hubs in the ordinary way, one at a time, on a multiple-spindle drilling machine, the time spent in loading and unloading the jig was almost as much as the actual drilling time. By suspending the bushing plate from the head of the machine at *A* and drilling two hubs while two were being removed and two more loaded at the front of the table, the production was increased from 50 to 200 hubs per hour. The machine was drilling 95 per cent of the time, the remaining time being required for the operator to index the table 180 deg. after each operation.

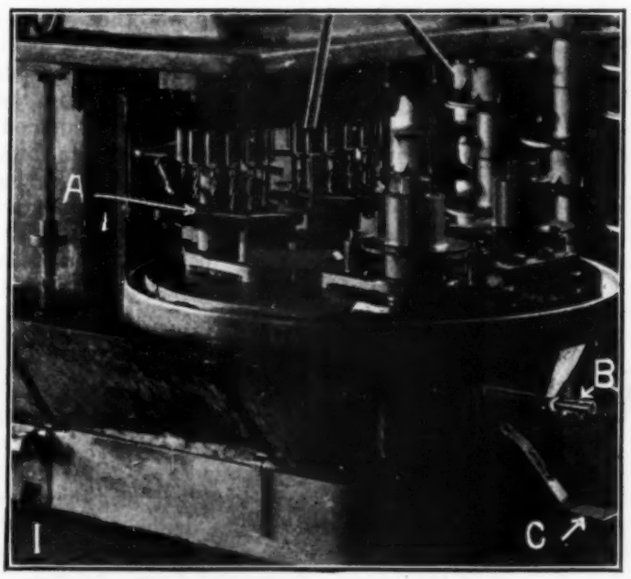
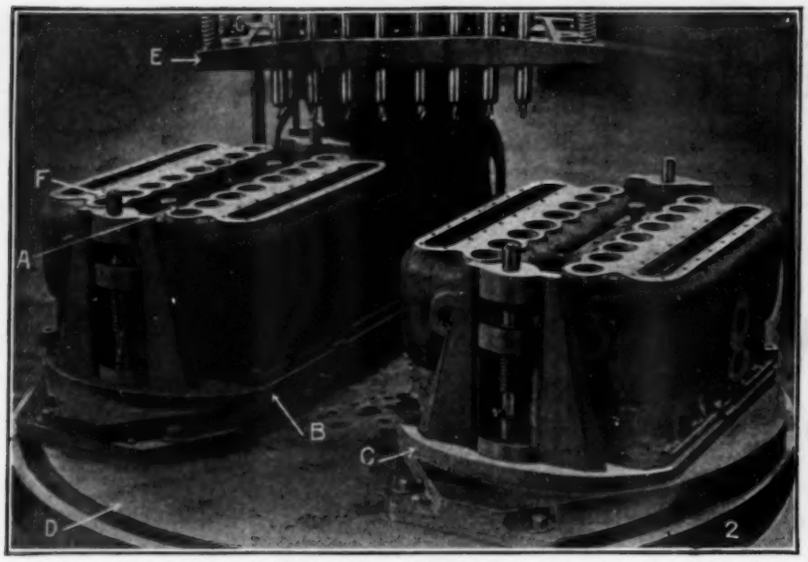


Fig. 1—Drilling hub flanges

The lever *B* controls the indexing pin in the table for locking it in the various positions. The pedal *C* raises the table on the ball bearing so that it can be easily swung from station to station.

The cylinder block of a prominent motor builder presented an entirely different problem as shown in Fig. 2. The operations to be performed were reaming out the cored valve-openings *A* and also going on through these openings and drilling the valve-stem holes. It was essential that the valve-stem holes be concentric with the valve openings.

Two indexing fixtures, *B* and *C*, were mounted on



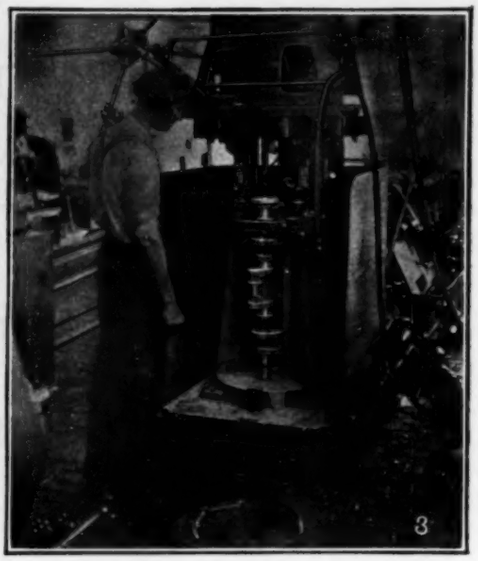


Fig. 2—Rotating and indexing fixtures. Fig. 3—Drilling and reaming crank flanges

the rotating table *D*, and each fixture held two cylinder blocks. The table was indexed to bring one of the fixtures under the bushing plate *E* which located over the pins *F* when the head of the machine was lowered. Drills in the front row of spindles *G* drilled the eight valve-stem holes in the block nearest the center of the table, while tools in the eight spindles at the rear reamed the cored valve-openings *A* in the block toward the outer edge. While these operations were being performed the operator loaded two blocks in the fixture

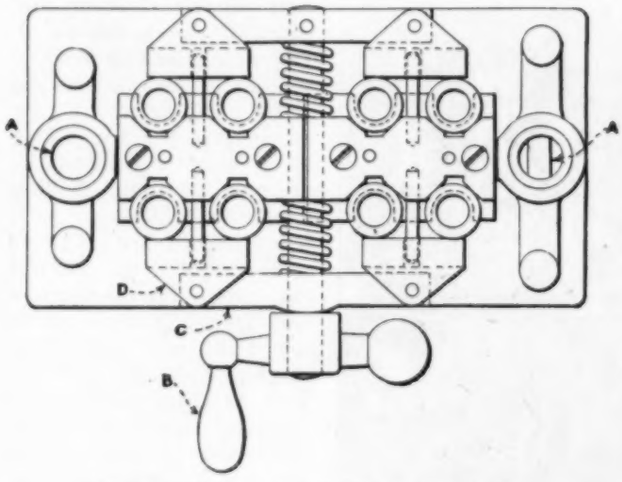


Fig. 4—Fixture for drilling piston pins

at the front of the table. The operations completed, the rotating table was indexed 180 deg., so that the blocks that had just been drilled and reamed came to the front Instead of removing the blocks from the fixture the operator merely rotated it 180 deg. The next indexing of the table brought the blocks back under the head of the machine in their exchanged positions and the block that had the openings *A* reamed, now had the valve-stem holes drilled and the block that already had the valve-stem holes drilled was in the position for reaming the openings *A*. This operation finished, the table was indexed half around again and the operator removed the two completed blocks and loaded two more into the fixture. In this manner two reamed and drilled cylinder blocks were completed every full revolution of the rotating table. The blocks were located over dowels that entered holes previously drilled in the bottom and were clamped in place by ordinary clamp bars.

A crankshaft drilling and reaming fixture built along the same lines as a rotating table is shown in Fig. 3. The crankshaft was too long to permit the fixture being mounted on a rotating table, so the fixture itself was made to index to three positions. The crankshaft shown at the front is in the unloading and loading position while two other shafts are out of sight at the rear of the fixture in the drilling and reaming positions. The six flange-holes are drilled in the first indexing position and reamed in the second, three crankshafts having their flanges drilled and reamed at every complete revolution of the fixture. The plate carrying the guide bushings is suspended from the head of the machine. A constant flow of cutting compound flows on this plate and through the bushings directly on to the cutting tools. A ball thrust-bearing in the lower part of the fixture permits it to be easily indexed.

Set-up for Drilling Piston Pins

A firm manufacturing replacement piston-pins used a rotating table set-up to advantage for drilling the holes through the pin blanks. Two fixtures, as shown in Fig. 4, were mounted on opposite sides of the table and while the drilling was being performed on the pins in one fixture, the operator had ample time to unload the eight drilled pins from the other fixture and reload it again. As in the other cases, the bushing plate was suspended from the head of the machine and located over the dowels *A*. The crank *B* clamped all eight pins by means of the equalizing bars *C* and the floating clamp-pads *D*. The same fixtures would accommodate several different diameters of pins by using other bushing plates, as any pin that could be clamped in the V-s could be drilled.

A popular type of jig for holding a complete set of main-bearing caps for drilling is shown in Fig. 5. This jig is of the lid type and is used in pairs, as shown at *A*. While the set of caps in one jig are being drilled, the operator has the lid of the other jig laid back in

front of him for loading and unloading. The caps are clamped directly to the lid of the jig, for the drilling must be done from the same side as the locating. The ends and faces of the caps are finished, as shown at *B*, and the three point equalizer *C* locates in the bearing portion. A bar *D*, slotted at the end, is slipped into place and carries knurled thrust-screws that force the caps against the lid of the jig. The wedges, *F*, are screwed into place and force the end caps against stops *G*. One of the wedges also forces the center cap against a stop. When the caps are loaded, the lid of the jig is turned back into place and fastened down by a quarter turn of the locks *H* and the jig is then ready for operation. As this method completes a set of main-bearing caps at every indexing of the table, it has proved very popular.

In Fig. 6 is illustrated another case where it is necessary to drill cylinder heads from the locating side. Both a drilled and undrilled cylinder-head are shown standing against the table. The fixtures are of the revolving type and the operator turns the one bottom side up for loading and back again when the loading is completed and the part is ready for drilling. Turning the fixture over has the added advantage of cleaning out the chips.

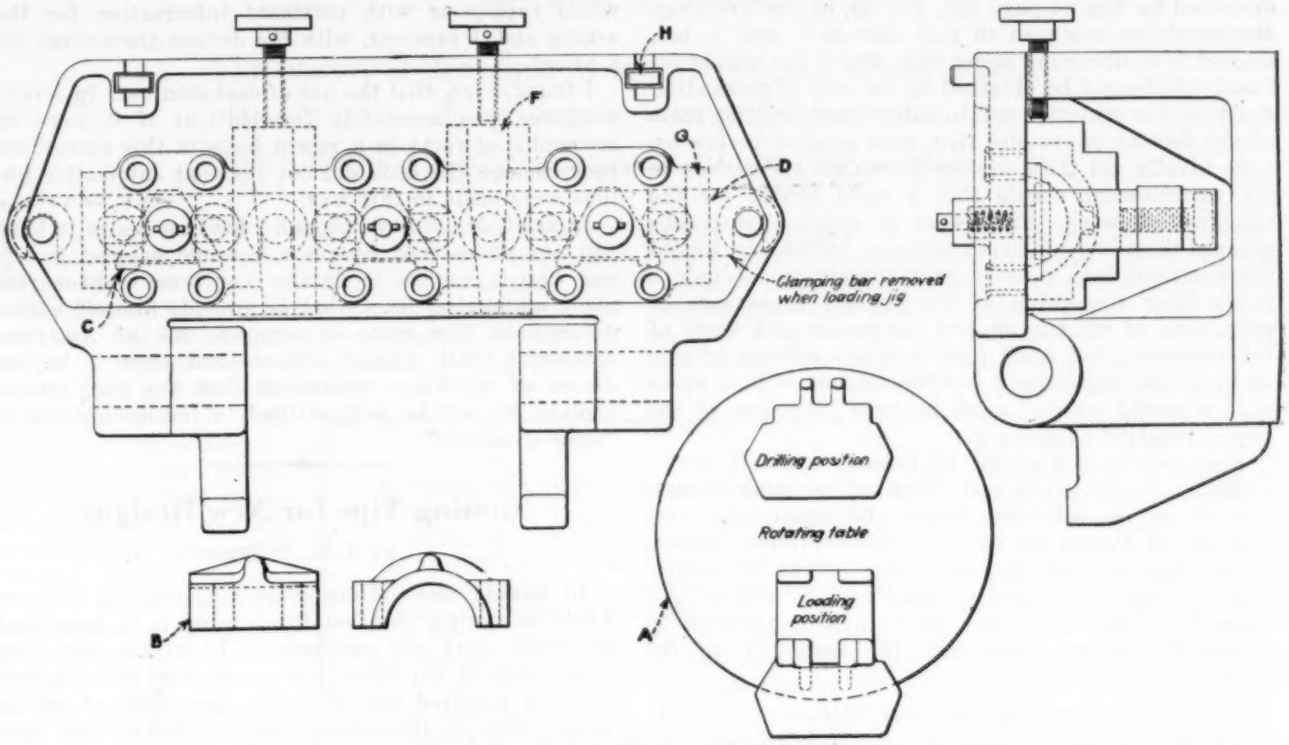


Fig. 5—Drilling motor bearing-caps

One important point should always be borne in mind when tooling up a rotating-table job and that is that the prime object is to keep the machine in operation as nearly 100 per cent of the time as possible. The only time that the machine is not in operation should be while the table is being indexed. The loading and unloading time of the idle fixtures should be less than the operating time of the machine and the ideal combination for maximum efficiency is to have enough fixtures to be loaded and unloaded to keep the operator busy the same length of time that it takes to actually perform the machining.

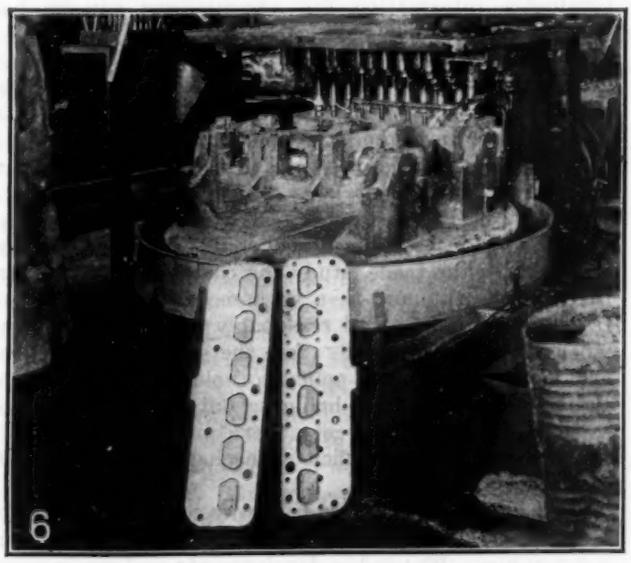


Fig. 6—Drilling cylinder heads

Millions Lost By Bad Marking

Proper and distinct marking is essential in export trade. However carefully an exporter many construct his containers and pack his merchandise within them, if the marking is illegible, easily rubbed off, or becomes blurred and unreadable through dampness or the rubbing to which a package is subjected on an ocean voyage, loss of goods or months of delay in receipt of the shipment, are most likely to result. Losses from improper and incorrect marking run into millions. Too much emphasis can not be placed on correct marking, says the Transportation Division of the Department of Commerce.

The American Machinist—A Dream Book

By Harry Senior

I WAS much interested in following the vagaries of the dream experienced by A. L. De Leeuw and described by him on page 825, Vol. 59, of the *American Machinist;* so much so in fact that as I read I, too, seemed to be dreaming along with him of the wonderful results that could be obtained in the way of production could we but materialize into substantial realities some of the fleeting phantasies that were passing before us.

So vividly did these visions formulate themselves in my somnolescent noddle that I could almost *see* the machines at work. It was as if spirit photographs arrayed themselves in rapid sequence before my clouded consciousness and I could gain therefrom not only a fairly clear conception of the general appearance of each piece of mechanism and the nature and scope of its operations, but could form a pretty definite opinion as to its size and weight and the amount of floor space that it would occupy; even, in some instances, of the power required to drive it.

Reaching the end of Mr. De Leeuw's article I awoke, suddenly, to the stern realization of fact that dreams are not of necessity the vague and mysterious forerunners of things to come; that sometimes—indeed, often—they are but the legitimate effects of natural causes. Some are caused by fear, some by avarice, and some by ambition. Some have their foundation in mince-pie; others (this one, for instance) in the *American Machinist.*

Some Dreams Come True

The first of the machines to be presented to the subconscious minds of Mr. De Leeuw and myself was an automatic screw-machine with a magazine feed, busily engaged in turning out small wheels and similar parts at an astonishing rate and apparently without human aid. Turning, in my waking moments, to my files of *American Machinist* (which are rather complete; this item goes back about 20 years) I found that in this wonderful dream-book not only was the coming of such a machine foretold but it was described as in actual operation, and that it could be obtained from its makers, the Pratt & Whitney Co., upon the tender of sundry tokens in lawful currency.

Among other things that we saw—Mr. De Leeuw and I—in our dreams, were automatic slotting machines, with magazine feed, that were built to handle only the part upon which they were then engaged (Asa S. Cook Co.); automatic drilling and tapping machines, also with magazine feed, intended for the single purpose of drilling and tapping one kind, shape and size of part (Anderson Die Machine Co.); machines that would cross-drill and mill parts without human intervention (National-Acme Co., attachments for N.-A. automatics); machines that would take pistons and piston-pins out of a hopper, grind them to accurate size and deposit them in another hopper (Warren F. Fraser Co.); single-purpose gear hobbing machines that were built to hob only one kind of gear and without the "fixins" to make them universal (Brown & Sharpe Manufacturing Co.); grinding machines with a wide wheel, made to "oscillate axially" and with "automatic control of feed for accurate sizing" (Bryant Chucking Grinder Co.); and many others, the foundations for which were to be found and explained in this dream-book.

In the matter of power-operated chucks, that enable the operator to get along without "tightening up something with a wrench every few seconds all day long," I found that the Bullard Machine Tool Co., the E. Horton's Sons Co. and several other reputable firms would supply us with pertinent information for the asking and, I presume, with the devices themselves for a price.

I found, even, that the use of cast-iron bars in screw-machines was accurately foretold (as if it were an accomplished fact) in a recent issue of this marvellous book, though the book did not say that automotive pistons were made in this way.

In brief, Mr. Editor, though I have no desire to hand you any undeserved bouquets, I would suggest to any one who is subject to dreams (or even night-mares) along mechanical lines, that he provide himself with a dream-book like mine—a complete file of *American Machinist,* with proper indices—and *then* if he can dream of anything mechanical that the book cannot explain, he will be well entitled to the designation of "some dreamer."

Getting Tips for New Designs

By J. C. P. Bode

In making observations concerning possible improvements in design, the first thing to do is to keep track of repair parts and complaints. If certain parts have to be replaced too often it is a sure sign that improvement is required and if many complaints of similar nature come in, the chances are they will indicate weak spots which are to be redesigned.

Another guide to new construction or demand for new tools is found in repeated requests for special equipment. Many a golden opportunity has been passed up because not all of the information brought to our door has been thoroughly analyzed.

Salesmen are forever gathering the finest kind of information for new designs and new fields because they are in constant contact with our prospects. By close co-operation and by encouraging the salesmen, invaluable information for new designs can be had without much effort.

If a firm employes demonstrators they can bring home information that is not only good but bound to be practical. They have grown up with the firm's machinery and have the best opportunity to compare it with competing machines as well as to look at it from the users' standpoint.

One of the greatest mistakes that the chief engineer can make is to be a home body. He should go out and mingle with the trade, study the customers' needs from their standpoint, and then go home with a bag full of facts so that he can feel reasonably sure of the demand when the tool is ready for the market. In some organizations it is the policy to hold the duties of the chief engineer down to bringing out what the firm has settled on and in that case there must be someone in the organization of sufficient mechanical ability to do this scout duty.

In the final analysis the best way to get the facts for new designs is by mingling with the customer and helping him. Watch his developments and make yours in conjunction with his.

Industrial Cost Accounting for Executives

By Paul M. Atkins

The twenty-fifth article which takes up standard practice instructions — Installing a system of cost accounts — Instructions for the operation of the material journal

IT WAS pointed out in the article dealing with the organization manual that such a book was not intended to tell "how" the work was to be done, but rather "what" the duties of the several departments were. It was also stated that an organization manual should be supplemented by standard practice instructions for the routine work of the business. It was mentioned also in the preceding article that one of the most important mechanisms of aid in cost accounting was these same standard practice instructions. It is perhaps worth while, therefore, to pause long enough to consider this subject and to see, if possible, how the instructions are prepared and used.

To obtain any adequate idea of the function of standard practice instructions it is necessary to consider how a system of cost accounts may be installed. It is possible to devise a complete system in all its detail before any move is made to install the first part of it. On the other hand it may grow, here a little, there a little till the complete system of records and accounts appears. In either case, however, it is desirable to make use of standard practice instructions. Essentially they are the record of the procedure to be followed in carrying on the work of the department. and it is only in some such form that operations of a routine nature can be given any degree of permanency. A definite, lasting record of what is to be done is just as essential to the satisfactory functioning of a department as is a set of blueprints for the construction of a machine.

In the good old days back further than the memory of most readers reaches, the drawings of the finished product were incredibly few and crude and a great deal was left to the imagination and ingenuity of the foreman and workers who were to turn out the product. Now no sensible manufacturer would attempt to produce an article without having a complete set of blueprints for it, showing all specifications in detail. Insofar as the control of the routine operation of most departments are concerned we are only just beginning to emerge from the same kind of early condition of development through which drawings passed many years ago. It is still considered sufficient in most cases to give verbal directions in respect to the carrying on of the work and then be quite surprised when it is not performed. It is seldom realized how complex a seemingly simple task is until the attempt is made to put it in writing—any more than the complexity of an apparently small and not-at-all complicated machine is appreciated till assembly and detail drawings are made of it. This fact will be more fully appreciated when the last part of this article is read in which are given the directions for the operation of the material journal, a task which all too often is thought any clerk can perform.

> ESSENTIALLY standard practice instructions are the record of the procedure to be followed in carrying on the work of the department, and it is only in some such form that operations of a routine nature can be given any degree of permanency.
>
> It is not always possible to put the plans into effect exactly as they have been laid out, as almost invariably a little experience will show that the work can be better, easier, less expensive or some or all of these, by making changes in the plans as originally laid out for the performance of the tasks.
>
> These instructions have a double purpose in that they not only provide a means of keeping the various steps in a task constantly before the worker, but also serve as a reminder to the person doing the instructing of how the work is to be done.

We are inclined to use the name "standard practice instructions" quite glibly without any very serious thought in regard to the significance of the words employed. They are words which were not chosen in the first place without careful consideration being given to their meaning. "Standard practice" carries with it a whole volume of implication if one but pauses to consider them a moment. They carry the idea that a definite, uniform procedure has been established, one which should be followed until changed by some one who had sufficient authority. In themselves they do not imply that the procedure is the best one for the accomplishment of the task, nor the only one. In fact, standard practice instructions may well be prepared quite frequently before the final method of doing the work has been established. They do indicate, however, that progress is being made in the direction of what may be considered the one best method.

Like standards of all kinds, standards of routine operation do not bloom full grown at the very start. They are ordinarily the result of careful and thorough investigation, painstaking experiment, and constructive thought. In short, the cost-accounting methods should

For the author's forthcoming book. All rights reserved.

be thought out in advance as carefully as possible. There is seldom any excuse for rushing ahead and determining how records are to be kept without doing as much planning on paper as possible. Failure to think before acting usually results in unnecessary losses.

At the same time the idea must not be allowed to exist that it will be possible to put the plans into effect exactly as they have been laid out. Almost invariably a little experience will show that the work can be better, easier, less expensive or some or all of these, by making slight changes—sometimes quite extensive changes—in the plans as originally laid out for the performance of the tasks. The cost accountant is indeed foolish who will not avail himself of all opportunities for perfecting his work. Gradually the best method will be hammered out by thoughtful planning and conscientious testing of methods until it can be said that a standard routine has been attained which can be put in the form of standard practice instructions. Very often, it is true, at some intermediate point it is wise to prepare temporary drafts to be used till improvements can be made. In a certain sense all drafts are temporary since they are or should be subject to revision at any time, and from time to time they will be improved as the opportunity offers. The name implies, therefore, that the methods which are recorded are the result of conscious, constructive effort and are not the promiscuous growth of chance and circumstance.

Instruction to Employees

The word "instructions" in the title should also hold our attention. A mere record of operations simply as a record of what is being or should be done in the cost department would have some value and not a little interest, quite possibly sufficient worth to justify its preparation since the work of which they would be the record would have been done in any case. Their real value then lies, however, in their utilization for purposes of instruction of the employees.

Few cost accountants or business men realize the real basis for the permanency of the methods which they adopt. They plan and install what seems and proves to be satisfactory procedure for the work of some department and record it in the form of standard practice instructions, and yet, in a few weeks or months they find that the routine which they established is not being followed. The reason for this lies in the fact that real permanency depends not only on having written records like the standard practice instructions but in the adequate training of their employees. Until the workers have been taught what is to be done and really understand what they are doing there can be no permanency of the routine. In carrying on this training the standard practice instructions are the text-book. It is a rare student, however, who can master a subject with the aid only of books, he needs personal instruction in one form or another. Just so in the case of the employee, he needs to be taught how to perform his tasks having the standard practice instructions before him for a guide.

Another point in the training of individuals whether they are workers, students, or of any other class, and a point which is commonly overlooked except by those who have had experience in teaching is the necessity of repetition in order to insure a thorough grasp of the subject. The explanation may be understood the first time that it is presented, but in the multiplicity of detail some will escape, and it is essential to regain them by going over the presentation once more emphasizing the points which seem to have been slighted.

The department head should not be discouraged—nor should the employee—if, in learning a complex routine, there comes a time when little progress appears to be made. If the worker has the necessary mentality and is really in earnest, such a slackening in the rate of learning is to be expected for it represents what is commonly called a "plateau period" of learning when what has already been learned is being assimilated and the mind is being prepared to appropriate new facts and relationships. There seems to be no way of avoiding this for it appears to be an essential part of the learning process. It is usually a mistake, therefore, to keep changing employees on a job unless they are dissatisfied and refuse to exert themselves until such a period of time has elapsed as to make clear that the failure to progress is due to inability and is not the plateau stage in learning.

Value of Standard Practice Instructions

The value of the standard practice instructions as a text-book can hardly be over-estimated. They provide a means for keeping the various steps in the task constantly before the worker and also serve as a reminder to the person doing the instructing of how the work is to be done. No matter how familiar one is with any process it is remarkable to find how easy it is to depart from the standard unless one is constantly engaged in the work, and even then variations will unconsciously slip in. Insofar as the variations are improvements they should, of course, be incorporated in the standard practice instructions, and if they are not helpful they should be rejected.

Probably the best way to make clear just what is meant by standard practice instructions is to give an example. As the material journal, which was described in an early article of this series and referred to frequently since, is not very well known it has been selected in order to give a fuller presentation of its operation. It will be remembered that it is the book in which is recorded the value of the withdrawals of all stores and worked material from the store-room and hence from the controlling inventory accounts, and of the receipt of worked material in the store-room and its transfer from the worked material in process account to the worked material account.

STANDARD PRACTICE INSTRUCTIONS
For the Operation of the Material Journal

A. *Extension of Issues, Credit Slips, and Worked Material In Slips*

1. All issues, credit slips, and worked material in slips should come to the material journal showing the quantity of material issued or received, in the "quantity" space or column; a price for each item, in the "price" space or column; and a manufacturing or improvement order number or expense symbol in the "charge symbol" space, for each slip. If any of this information is lacking return the slip to the balance desk.

2. Multiply the price by the quantity for each item found in the spaces indicated above, using the comptometer, and enter the result in the "value" space or column. Especial care must be taken in the case of the group issues to make the entry in the correct column, for it will be noted that there are two "value" columns, one headed "stores value" and the other "worked material value." The value of the stores items must be entered in the "stores value" column and of the worked material in the "worked material value" column. There should be no difficulty in distinguishing stores items from worked material items for the symbols of the stores items all begin with an "S" and of the worked material items with some other letter.

3. Add the value of all stores items on each group issue and enter the total at the foot of its column. Do the same for the worked material. If the amounts are so large that there is any danger of the figures running together and becoming confused if put on one line, enter one total on the bottom line in its column and the other total on the line above in its column. Care in respect to this detail will prevent errors later.

B. *Sorting and Totaling of Issues, Credit Slips and Worked Material In Slips*

1. Sort all slips into six piles as follows:
   (1) Stores issues (black print on white paper).
   (2) Worked material issues (black print on green paper).
   (3) Group issues (black print on white paper but four times size of stores issues).
   (4) Stores credit slips (red print on white paper).
   (5) Worked material credit slips (red print on green paper).
   (6) Worked material in slips (blue print on green paper).

2. Sort the stores issues in eight piles as follows:
   (1) Manufacturing orders for merchandise (charge symbol is an "M" followed by a number).
   (2) Manufacturing orders for worked material (charge symbol is a "WM" followed by a number).
   (3) Improvement orders (charge symbol is a "J" followed by a number).
   (4) Administration expenses (charge symbol is an "A" followed by additional letters).*
   (5) Auxiliary manufacturing expenses (charge symbol is an "MA" followed by additional letters).*
   (6) Direct manufacturing expenses (charge symbol is an "MD" followed by additional letters).*
   (7) Selling expenses (charge symbol is an "S" followed by additional letters).*
   (8) Miscellaneous (charge symbol is something other than those described above. Take all miscellaneous issues to cost accountant who will direct how they shall be handled).

3. Sort all worked material issues into eight similar piles.

4. Sort all group issues into eight similar piles.

5. Sort all stores credit slips into eight similar piles.

6. Sort all worked material credit slips into eight similar piles.

7. Keep all worked material in slips in one pile.

8. There are eight piles for each kind of slip, except for the worked material in slips for which there is one only.

9. Add the value shown on the stores slips in the following manner:
   (1) Use a Burroughs duplex listing adding machine.
   (2) Add the value shown on each stores issue of a single pile in the upper register of the adding machine.
   (3) Add the value for stores shown on each group issue of the pile of group issues with the same symbol as that of the pile of stores issues in hand.
   (4) Transfer the total to the lower register by means of the transfer total key.
   (5) Repeat (2) to (4) above inclusive for each pile of stores and group issues.
   (6) When each pile has been added in the above described manner take a grand total of the figures recorded in the lower register. The adding machine tape now shows the total value of all stores issued divided into groups according to the main classification of accounts described in B-2 above.

10. Repeat B-9 above for worked material issues and group issues.

11. Next add the value shown on the stores credit slips in the following manner:
   (1) Use a Burroughs duplex listing adding machine.
   (2) Add the value shown on each stores credit slip of a single pile in the upper register of the adding machine.
   (3) Transfer the total to the lower register by means of the transfer total key.
   (4) Repeat (2) and (3) above for each pile of stores credit slips.
   (5) When each pile has been added in the above described manner take a grand total of the figures recorded in the lower register. The adding machine tape now shows the total value of all stores credited to orders and returned to the store-room according to the main classification of accounts described in B-2 above.

12. Repeat B-11 above for worked material credit slips.

13. Total the value shown on worked material in slips by means of a listing adding machine.

14. Check all additions to make sure that they are correct.

C. *Making the Entries in the Material Journal*

1. Take the adding machine tapes for stores issues and credits, labeling each transfer total with the symbol of the group whose value it records and turn to the stores section of the material journal.

2. Enter in black ink the date in the date column on the first line which has no entry on it in any column.

3. Enter the total value in black ink of all stores issued in the "total" column on the same line as the date.

4. Enter the value in black ink of each group of stores issues on the same line in the column which shows at its head the symbol of the group in hand.

5. Enter the total value in red ink of all stores credits in the "total" column on the next line after that on which the stores issues for the same day were entered.

6. Enter the value in red ink of each group of stores credits on the same line in the column which shows at its head the symbol of the group in hand.

7. Repeat (1) to (6) above inclusive for worked material issues and credit slips in the worked material section of the material journal.

8. Enter the total of the worked material in slips in the worked material in section of the material journal on the first vacant line. Also enter the date in the proper column on the same line.

9. Stamp each issue and slip with material journal date. Stamp and give them all to the cost accountant.

10. File all adding machine tapes after stamping them.

D. *Summarizing the Journal at the End of the Month*

1. At the end of each month perform the following operations on the material journal:
   (1) Add the black ink entries in the total column of the stores section on an adding machine.
   (2) Add the black ink entries in each distribution column taking transfer totals of each column and a grand total of all columns.
   (3) Compare with the figure found in (1) above. If there is any discrepancy find and correct it.
   (4) Repeat (1) to (3) above inclusive for the red ink entries.
   (5) Deduct the red ink entries for each column from the black ink entries and enter the net totals at the foot of the proper columns.

2. Repeat 1 above for the worked material section.

3. Total the column of the worked material in section, verifying and enter at the foot of the column.

4. Abstract the entries made in the column of each section and give the abstract to the cost accountant.

5. Open new sheets for each section for the following month.

N. B.

1. If, for any reason, it seems to be impossible to follow the above instructions report the matter at once to the cost accountant.

2. If any question arises about the correctness of interpretation of any slip which comes to the material journal for entry, take the question up at once with the cost accountant.

The above illustration is a typical example of one kind of standard practice instruction—the instruction which explains the details of the task of some particular position. There is also another variety which is valuable for other purposes and which complements the kind

*It is not necessary to pay any attention to numbers beginning with an "R" or "W" which also appear sometimes in charge symbol space.

shown here. It embodies a detailed description of the routine followed by a particular form—a stores issue, for example—from the time it is made out till it reaches its final resting place. When a complete set of both kinds of standard practice instructions are available there is little excuse for continued failure to do work in the manner prescribed. The work of the cost accountant in charge of the department then becomes very largely a matter of keeping the instructions up to date and of seeing to it that they are followed.

A Railway Museum in England

By Hubert Bentley

IN THE editorial notes on page 458, Vol. 59 of the *American Machinist*, and also in Mr. Thwing's letter on page 452, the desirability is expressed of establishing a museum for machine tools.

In England, a railway museum has recently been established, and a few particulars of the more interesting relics will no doubt be of interest.

With the grouping of the several railway companies of Great Britain into four main systems, there passes, and in course of time will pass, many features familiar to the traveler in the Old Country. One of these railways, the old North-Eastern, the pioneer railway, has established, at York, a railway museum, illustrating various phases in the development of the railway systems of the country.

There is exhibited the table of the board of directors of the old Blyth and Tyne railway. At the head of the table is the chair that was occupied by the chairman of the Hull and Barnsley Railway, and round the table are arranged four chairs formerly used by the directors at board meetings of the Stockton and Darlington railway. One part of the collection is devoted to the early electrical instruments used on the railways. These include not only telegraph instruments for signaling, but two terminal disks for mechanical telephones connected by a taut wire, and which gave a speaking capacity over 500 yards. There is also a "thunder pump," a device for ringing a bell without the use of electric batteries.

An exhibit of special interest is the portable double-needle telegraph instrument, which accompanied the train on which Queen Victoria traveled on the East Coast route, and was intended for connecting with the line side-wires in the event of a breakdown. There is also a remarkable distance recorder, a somewhat clumsy ancestor of the speedometer, which was attached to locomotives on the Newcastle and Carlisle railway in 1858.

Literature exhibited includes copies of old surveys for projected railways, and also for the canals which preceded them in the very early days of the nineteenth century and the late years of the eighteenth century, when projects for canals were as frequent as those for railways afterwards became. A collection of stationmasters' truncheons, takes one back to very early railway days, when stationmasters were special constables. There are also some motor goggles for guards, to protect them from the dust when riding on the tops of the coaches. Specimens of early tickets are shown, as is also the date stamping machine invented by Thomas Edmondson, stationmaster at Milton (now Brampton), in 1836. Coats of arms of several of the old railways are of special significance.

Particularly interesting are the scarlet coats of the guards of the Stockton and Darlington railway, replicas of the guards' coats in the coaching days, and the armlets and head badges worn by policemen on the Great North of England line, who regulated traffic before the adoption of signals, pretty much as policemen on point duty act on the roads today. Indeed there are still a few pensioned old-time drivers who still refer to the signalman as "the bobby." An acquisition to the museum is one of the original "dandy" wagons used on the Stockton and Darlington railway.

The "dandy" wagon recalls the days of horse traction on the early railways. The "dandy" wagon is a bogie or light truck upon four wheels, raised between 18 in. and 2 ft. from the ground, and in this the horse, which had hauled the wagons up an incline, used to ride while the train went down hill by gravity.

In the "History of the North-Eastern Railway," the author says: "A horse was not long in learning how to get on the "dandy" cart, even when it was in motion, after he had once grasped the agreeable fact that there was a basket of hay at the end of it. When unhitched near a run, he would allow the wagons to pass him, and trotting after the train, leap on the low truck of his own accord, performing the feat with so much eagerness as to render it difficult to keep him off. As if conscious that his position on the truck was not without danger in the event of a sudden stop, he prepared for such a contingency by resting continuously on his haunches. At the bottom of a run he would get down of his own accord, as nimbly as he got up, and resume pulling."

Primitive Equipment

Some examples of early permanent-way equipment; stone sleepers, chairs, primitive fog-signalling and other apparatus have been collected together. The exhibits also include luggage "boots," and a manual fire engine.

The acquisition of two spans of the first iron railway bridge in the world is of engineering interest. This bridge formerly spanned the River Gaunless, at West Auckland, on the original Stockton and Darlington railway. It crossed the river on four spans of approximately 12 ft. 6 in. each. Each girder is of wrought iron, consisting of two segmental arches, one curving downward and the other curving upward, their ends uniting at the point of intersection in a cast-iron boss. Vertical tie rods cast round both members were extended upward to form a support for the way beams. The structure rested on three piers, each composed of two cast-iron columns braced together. In order to afford a better idea of this pioneer railway bridge, which is one of Stephenson's earliest efforts, it is proposed to re-erect the two arches.

One of the first passenger coaches used on the Stockton and Darlington railway has also been secured. This is of the usual early type, consisting of three compartments, two seconds, with a first-class in the center. The second-class seats are hard wooden boards, the only windows being in the doors, while the first-class compartment has small windows above the seats, the latter being upholstered with hair cushions and backs in blue cloth. The coach is painted teak color, and, if this is the original color, the new tone adopted by the London and North-Eastern Railway is merely a reversion to the color of the first British railway.

It will be evident from the foregoing that the Museum will afford splendid information on the evolution of railways, and valuable alike to the railway and engineering student as well as to the general public.

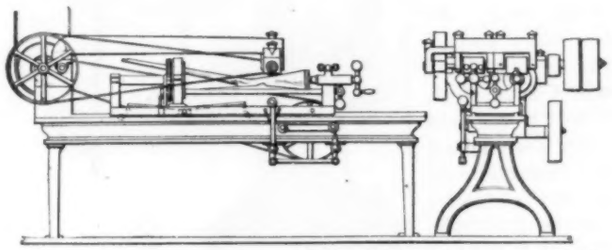
Development of Machine Tools in New England

By Guy Hubbard

The twelfth article—Some of the old Windsor machine tools still in use—Old drawings tucked away in a vault — Development of the drilling machine

IN CONSIDERATION of the large number of brilliant mechanics gathered together by the Robbins & Lawrence Co., it is not strange that the machinery which was the product of their genius and skill should have had through its novelty and excellence, a marked influence upon machine design and manufacturing methods.

Although more than seventy years have elapsed since many of these Windsor machine tools were designed and built, the writer has been particularly fortunate in locating many of them—not in storage or on scrap piles, as might be supposed, but in profitable operation in progressive American shops. He has also been fortunate in locating, mostly in the vault of the Jones & Lamson Machine Co., many of the orginal designs from which these machines were built.



Courtesy the Jones & Lamson Machine Co.

Fig. 67—Robbins & Lawrence gun-stock lathe built for the Enfield armory

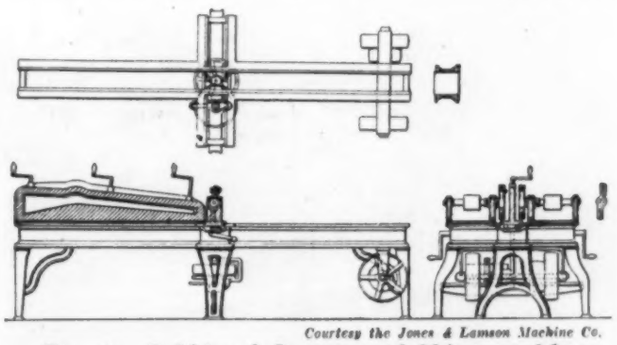
(From the original drawing)

Of the purely gun machines, the earliest to be put into common use were those for making stocks, and the most complicated of these stocking machines were the form turning lathes invented by Thomas Blanchard at Millbury, Mass. in 1818. A Blanchard lathe, which is still preserved there, was set up at the Springfield Armory, in 1822, and a machine of this type was used at the Windsor Armory in the early days. Under the hands of Mr. Howe and Mr. Stone the gunstock lathe was refined and developed to a point almost as high as at the present day and several were especially built for turning the stocks of the Enfield rifles. These machines, one of which is shown in Fig. 67, employed high speed burrs running on shafts at right angles to the stock and former, were provided with automatic feeding and stopping mechanisms and worked very smoothly and rapidly. Gunstock lathes were built by the Windsor Machine Co. as late as 1900 and were the last special gun machines to be manufactured in that town.

Subsequent to 1849 the black walnut blanks for gunstocks were roughed out at the Windsor Armory by the use of the Hedge bandsaw. The blanks were then "slabbed off" on both sides in a special revolving planing machine, as shown in Fig. 68, designed by Henry D. Stone. The machines used for bedding the locks were the edging machines (to be later described), speeded up for cutting wood instead of metal.

Of the special machine tools for gun work, the Robbins & Lawrence rifling machines were evidently inspired by a peculiar planer built by Silver & Gay in 1844 for fluting textile rolls, and shown in Fig. 69. This machine had a cam principle for turning the rolls during the planing operation, which was almost identical with that used for turning the rifling tool in the Robbins & Lawrence rifling machines.

The earliest rifling machines, the type used by the Windsor custom gunsmiths, had heavy wooden frames, with clamps to hold the barrels, the twist being given by the passage of a square rod (which had been twisted while hot) through a square hole which acted as a nut. The rifling tool was split at the end to give it spring, and had little file-like cutters set into the spring end.



Courtesy the Jones & Lamson Machine Co.

Fig. 68—Robbins & Lawrence slabbing machine for gun stocks

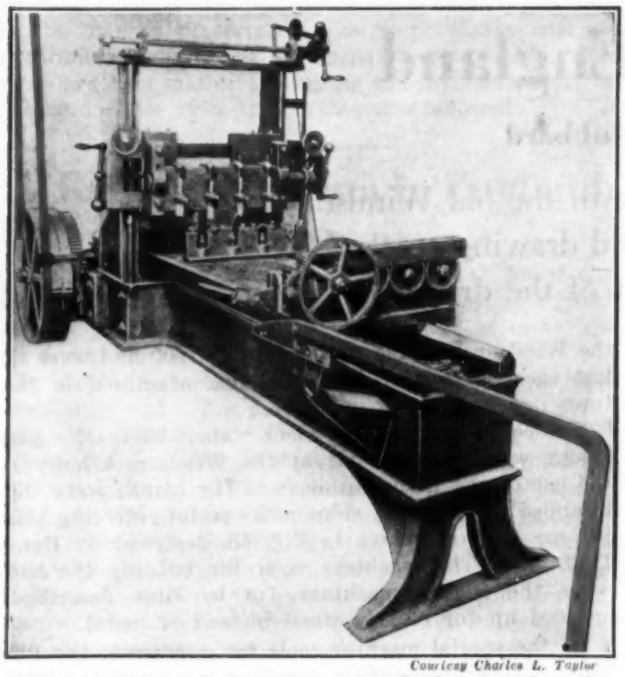
(From the original drawing)

This tool was attached to the twisted rod and was pulled through the barrel by a heavy, hand-driven flywheel traveling in a rack on the bed.

The Robbins & Lawrence rifling machine, Fig. 70, which was the result of the joint efforts of Mr. Lawrence, Mr. Howe and Mr. Stone, was built with a

For the author's forthcoming book. All rights reserved.

horizontal cast-iron bed in the form of an oil trough and the rifling tool was reciprocated by a crank, connecting rod and crosshead. The crank was in a flywheel on the drive shaft and could be adjusted to suit the throw to the length of the barrel—an adjustable counterweight being placed opposite the crank to balance it. The cam that turned the rifling tool was much like that of the Silver & Gay roll planer and was attached to the top of the middle of the bed, where it could be adjusted on a segment to regulate the pitch of the rifling. The cam turned the rifling tool by a sliding rack set vertically in the crosshead, acting upon a pinion on the clutch shaft of the rifling tool. The upper end of the sliding rack was attached to a pivoted block sliding in the cam slot, thereby revolving the clutch shaft as the crosshead reciprocated. The rack was split through the middle, one half being adjustable to take up any backlash in the pinion. The barrel to be rifled was held in a chuck and revolved one groove at each stroke of the single-cutter tool, by the action of a cross-slide operated by a cam on the crosshead. The cutter was automatically adjusted during the rifling operation.



Courtesy Charles L. Taylor

Fig. 69—Silver & Gay planer for fluting textile rolls (1844)

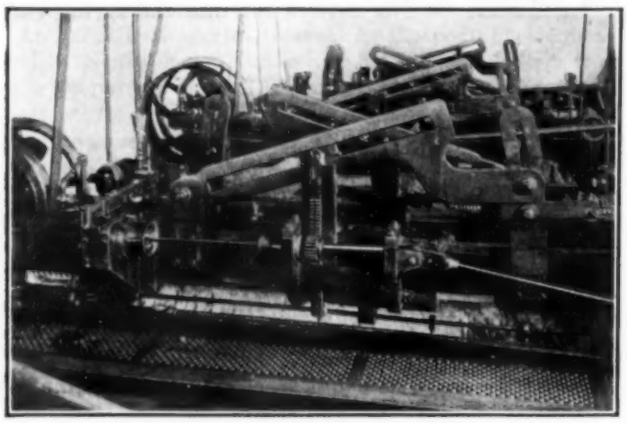


Fig. 70—Robbins & Lawrence rifling machine

Another Robbins & Lawrence rifling machine was designed by Frederick W. Howe in 1853 for rifling pistol barrels, and as originally built, had an output of 100 barrels per day. In 1854 Henry D. Stone successfully adapted machines of this type to cut three grooves at once in the 42-in. barrels of the Enfield rifles—the longest machine rifling previously attempted having been 33 in. This design was adopted at the Springfield Armory in 1861, and was also adopted by the Pratt & Whitney Co. who furnished machines of this type to the leading armories in Europe.

Starting with a crude bench drill originally designed by the National Hydraulic Co. in the early '30s, Mr. Lawrence and Mr. Howe, between 1844 and 1856, developed a very complete line of drilling machines, the last of which would be considered very good, even today.

The bench drill upon which they based their designs was originally built with a wooden frame but was redesigned by Mr. Lawrence about 1844 with a cast-iron frame. It was a single-speed machine, to be driven with a round belt or rope by a pulley mounted upon a horizontal shaft at the rear. At the inner end of the drive shaft was a bevel gear which meshed with one upon the lower end of a vertical shaft in the frame. The vertical shaft was arranged to slide far enough to bring the bevel gears out of mesh and in this crude way the machine was stopped and started. The spindle sleeve was a revolving tube mounted in the front of the frame and the spindle proper was keyed to revolve with it, but was free to slide up and down in the tube. The sliding action took care of the feed and was controlled by a hand lever pivoted to the rear of the top of the frame and connected to the spindle by a link and socket. When free, this lever was held up by a cord and weight in connection with a pulley block on the ceiling. Neither the weight nor the lever for throwing in the gears are shown in the isometric drawing, Fig. 71, which was made in 1854 from the machine itself.

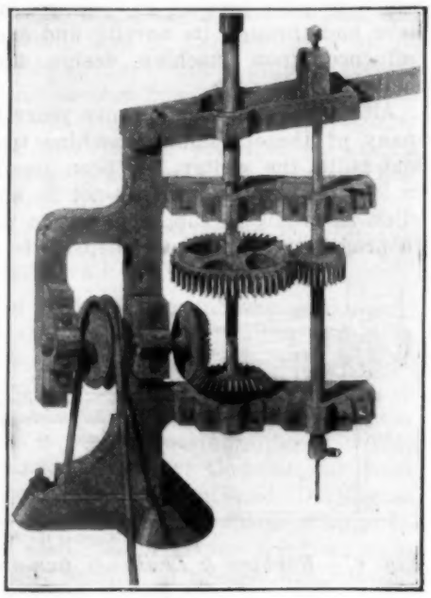


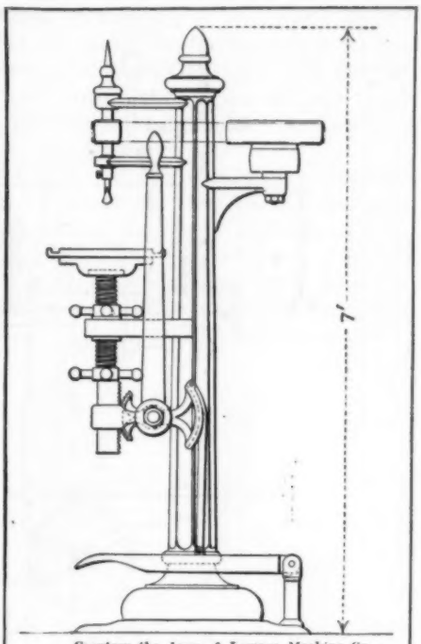
Fig. 71—One of the early Windsor drill presses

(From an original drawing)

The next step was a handsome pedestal sensitive-drill, Fig. 72, designed by Frederick W. Howe in 1850, in which rather good mechanical ideas, and some architecture were combined.

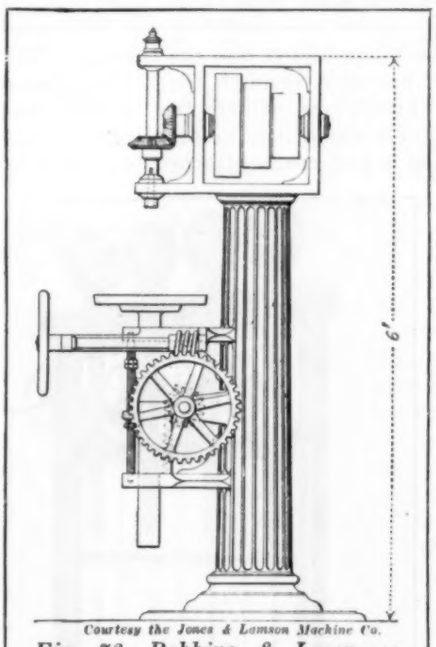
In this machine the spindle, which had no up and down movement, was driven by a vertical jack shaft behind the central column, this shaft being in turn

driven by a quarter turn belt from a wall countershaft. The feed was obtained by lifting the table and work to the drill. The table was mounted upon a heavy threaded bar having a rack at its lower part, and fitted to slide in two brackets on the front of the column. This bar was raised and lowered by a segment-gear meshing with the rack and actuated by a vertical hand lever pivoted to the lower bracket. Opposite to this segment gear was another similar but smooth segment, at the upper end of which was pinned a heavy leather belt connected to a treadle pivoted to the base of the machine. By pressing the treadle with the foot and pulling the lever forward with the hand the foot was made to work against the hand in raising the table—thus obtaining a steady and delicately controlled feed. This machine was arranged for the rapid drilling of many holes of the same depth in interchangeable work by having two large nuts in the form of handwheels upon the threaded bar—one above the upper bracket and one below. By setting these nuts and locking them in place by setscrews, the movement of the table was accurately limited. The table itself was slotted for fastening jigs and fixtures and, by releasing a setscrew, could be revolved to any position.



Courtesy the Jones & Lamson Machine Co.

Fig. 72—Robbins & Lawrence sensitive drill (1850)
(Drawn from original layout)



Courtesy the Jones & Lamson Machine Co.

Fig. 73—Robbins & Lawrence drill press with elevating table and depth gage (1852)
(Drawn from original layout)

In 1852, a much more powerful and rugged drill press, not of the sensitive variety, was designed along similar lines by Mr. Howe. This machine, Fig. 73, had an architectural but fairly sensible column of large size, at the top of which was mounted a frame containing a horizontal drive shaft and a three-step cone driven from an overhead countershaft, and between two brackets at the front of the frame was the spindle, which was driven from the drive shaft by bevel gears, but had no sliding movement.

The table was carried upon a heavy vertical bar having a rack but no threads. The table was lifted to the drill by worm gearing, pinion and rack as shown. This geared train gave great reduction and resulted in a smooth and powerful hand feed. In this machine the depth gage consisted of a threaded rod mounted in the brackets in front of the table bar. A lug on the table bar slid between two pairs of nuts upon the threaded rod that could be set and locked to limit the depth of feed.

These last two machines were built and sold in large numbers. From the three machines described were developed the Robbins & Lawrence four and six spindle sensitive drills of 1853-56, which would be considered efficient manufacturing machines today—and are in fact so used in several up-to-date shops. These later machines, Fig. 74, have the jack shafts at the rear much like the ancient bench drills except that they have three-step cones for flat belts. The frames are of sensible box sections designed for rigidity rather than beauty. Mr. Howe broke away from the architectural idea long before most designers did. The jack shaft drives a vertical shaft through bevel gears, and at the center of the vertical shaft (in the case of the four-spindle drill) are mounted three small pulleys for broad belts. In front of the vertical shaft is set the row of spindles in a frame at right angles to the jack shaft. From left to right, the first spindle is provided with a single pulley near the bottom, the second spindle with a single pulley near the top, the third with a double pulley near the bottom and the fourth with a double pulley near the top. When belted up to run all spindles, the vertical drive shaft is belted from its upper pulley over the lower pulley of the right hand or fourth spindle, and the upper pulley of this spindle is belted to the pulley of the second spindle, thus driving two of them. The lower pulley on the vertical shaft is belted to the upper pulley of the third spindle, while the lower pulley of this spindle is belted to the first—thus driving the other two. The elevating table works upon the principle of

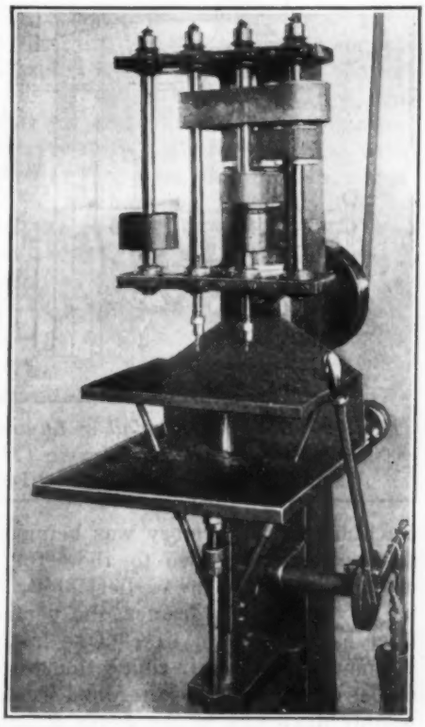


Fig. 74—Robbins & Lawrence multiple-spindle drill press. Built in 1853

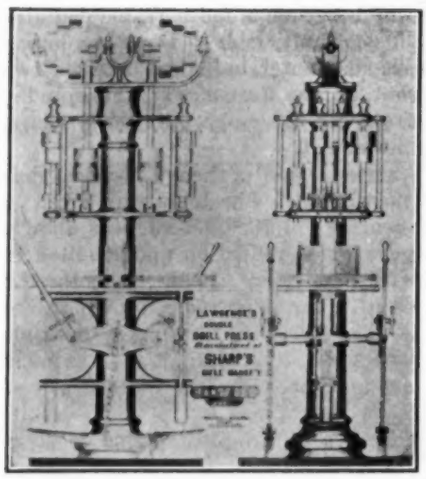


Fig. 75—Lawrence double 4-spindle drill
(From the original drawing)

the combined hand- and foot-operated sensitive drill of 1850, but it has a depth gage similar to that of the heavy drill press of 1852. This machine was one of the Robbins & Lawrence designs adopted in the '50s by George S. Lincoln & Co. of Hartford, and something almost identical was later built for many years by the Pratt & Whitney Co. Mr. Lawrence also brought out, in 1853, at the Sharps plant in Hartford an adaptation of this design as shown in Fig. 75, in which two of the four spindle drill presses were mounted back to back upon a single column, in order to economize space.

It will be remembered that Robbins, Kendall & Lawrence began under high pressure and built its own machines as the armory was being erected. Partly on this account, and also to allow for easy experimental changes, many of the earliest of its machine tools were built with wooden frames, the perfected designs being later carried out in iron. One instance of such a development occurred in connection with two large upright drills, of which the writer has located the original assembly drawings in the Jones & Lamson vault. These original drawings are stained and brittle with their seventy-five years of storage, but were copied carefully and are reproduced herewith.

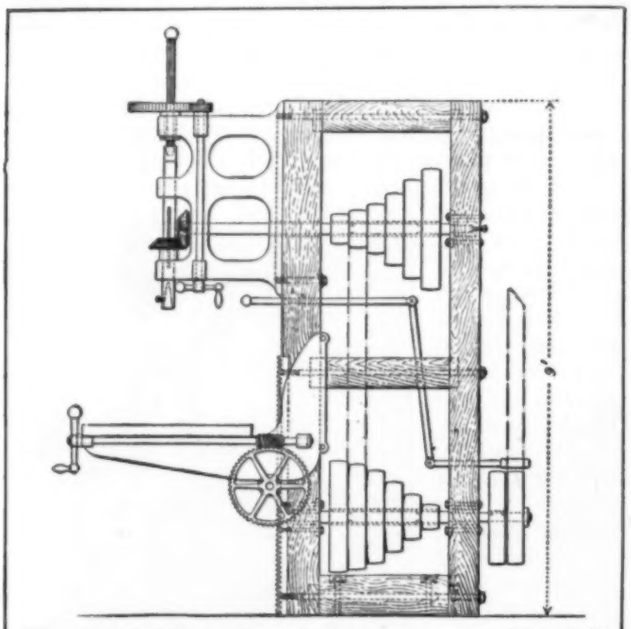


Fig. 76—Robbins, Kendall & Lawrence upright drill with timber frame (1847)
(Drawn from original layout)

The first of these two drill presses, see Fig. 76, was constructed in 1847, and had as a basis a rectangular frame of massive oak timbers—9 ft. high. At the lower part of the frame was a horizontal jack shaft having tight and loose pulleys and a six step cone. This shaft ran in cast-iron bushings bolted into the timbers. The spindle driveshaft extended through the timber frame into a cast-iron bracket in which the spindle was mounted. The spindle was driven by bevel gearing and was fed by turning a ball crank attached to a vertical shaft beside it. At the top of this shaft was a pinion which meshed into a large spur gear above the spindle. The large gear was attached to a nut held in place by a bearing in the upper bracket of the frame, and in the nut traveled a feed screw having a left-hand thread. The feed screw was connected to the top of the spindle by a socket coupling.

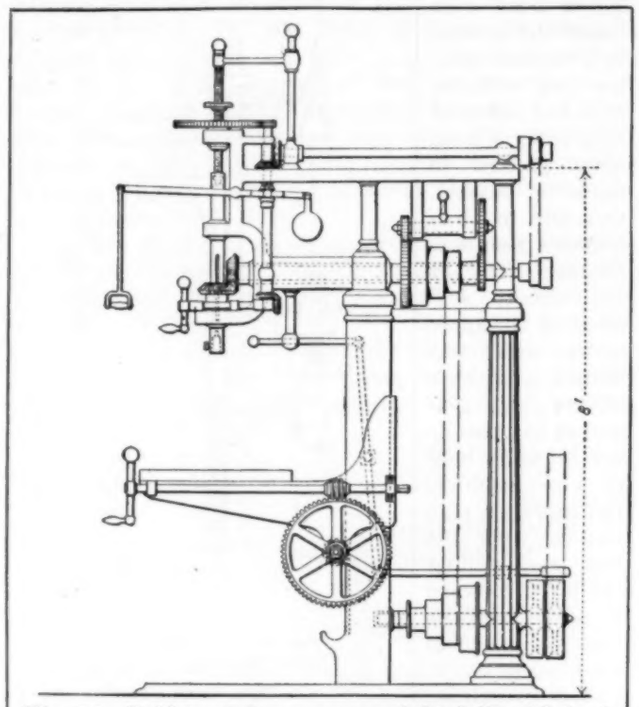


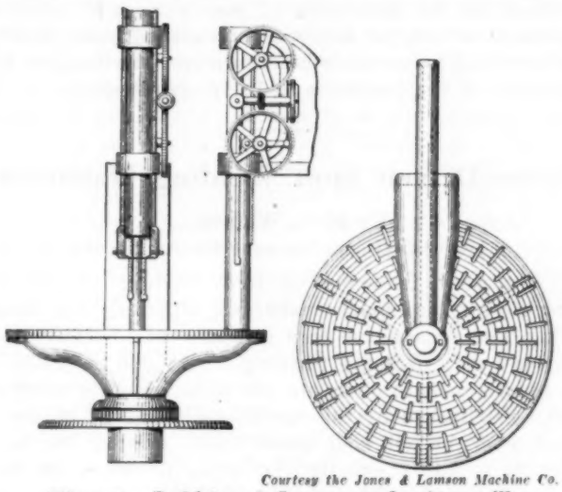
Fig. 77—Robbins & Lawrence upright drill with back gears and power feed (1848)

The heavy, cast-iron table of this machine could also be employed for

Fig. 78—Robbins & Lawrence 4-spindle barrel-drilling machine
(From Census Report of 1880)

feeding work to the drill if desired. The table was cast integrally with an apron fitted to slide upon the front timber of the frame, and at the base of the apron was a cross shaft carrying a worm-wheel and a pinion which meshed with a rack bolted to the timber. The table was raised and lowered by turning a ball crank at the front, which revolved the cross shaft through a worm. The machine was stopped and started by a belt shifter having a sliding fork over the drive pulleys and operated through a pivoted lever by a ball handle in a convenient position at the front.

The timber-framed machine was evidently a success, for in 1848 Mr. Howe developed the design into an iron-framed drill press having such refinements as back gears, and a three speed power feed. See Fig. 77. The frame of this machine, which was 8 ft. high to the top rail, had architectural cast-iron columns mounted



Courtesy the Jones & Lamson Machine Co.

Fig. 79—Robbins & Lawrence boring mill
(From the original layout)

upon a cast-iron base. The driving and shifting mechanisms, hand feed mechanism, spindle, and table were almost identical with the design of 1847, except that the cones had but four steps.

The feed mechanism was the same as in the previous design, except that the ball crank was mounted upon a horizontal shaft in a more convenient position in front of the spindle, and drove the vertical shaft through a pair of bevel gears. Power was applied to the feed by a belt running on small cones and controlled by a clutch on the vertical shaft. The depth gage idea was applied to this machine in the form of a hand nut mounted upon the feed screw above the large spur gear. When this nut came in contact with the upper face of the gear, it stopped the feed by jamming the feed screw and slipping the belt on the feed cones.

Upright drills of this type were built for sale in considerable numbers and one of them was kept in almost daily use for nearly seventy years. One of these machines ran in the shops at Windsor until 1888, when it was removed to Springfield, Vt., by the Jones & Lamson Machine Co., where it continued in use for more than twenty years.

Another special type of drill press developed by the Robbins & Lawrence Co. was the four-spindle barrel drilling machine designed by Frederick W. Howe in 1852, and shown in Fig. 78. In this machine the four barrels were held vertically in revolving chucks at the base of the frame, while the stationary drills were pressed down from the top by weighted spindles. This machine was applied to the full-length drilling of steel rifle barrels from the solid bars. One man could tend to two or more of these machines, each of which would drill twenty barrels a day.

During the latter days of the Robbins & Lawrence Co. at Windsor, Henry D. Stone amplified the idea of Howe's barrel boring machine into a vertical chucking lathe—now known as a boring mill. While only a partial assembly of this machine, which is illustrated in Fig. 79, is in existence, it appears not at all dissimilar to boring mills of the present day.

Failure to Equip Pneumatic Hammer With Safety Device Renders Employer Liable

By Leslie Childs

THE question of the liability of an employer for injury to an employee caused by a failure to equip tools and appliances with up-to-date safety devices, is one of particular interest to employers of mechanics and artisans and has been the cause of considerable litigation. While the decisions on this point are not precisely in accord, there is much authority to the effect that where an employer fails to equip his tools with safety devices and a workman is injured in using such tools because of a lack of this protection, the question of whether the employer may be held liable for negligence will be one of fact.

The application of this rule of law, to an accident arising in a mechanical trade, is illustrated in an interesting and instructive manner in the recent Missouri case of Knott vs. Missouri Boiler and Sheet Iron Works, 253 S. W. 749.

In this action the plaintiff, Knott, was in the employ of the defendant, Missouri Boiler & Sheet Iron Works. Upon the occasion out of which the action grew, the plaintiff was assisting in the repair of a locomotive and using a pneumatic hammer. His foreman was with him, and after a prosser had been driven into a flue the foreman handed the air hammer to the plaintiff to hold while he worked the prosser out of the flue. The plaintiff took hold of the air hammer, holding it in a horizontal position, and as the foreman stooped to get an ordinary hammer with which to loosen the prosser, he bumped against the plaintiff in such a manner as to throw the air hammer into a perpendicular position. The die was projected out of the barrel of the hammer, striking plaintiff in the face, and the loss of the plaintiff's left eye resulted.

Negligence of Employer Claimed

The plaintiff thereafter brought the instant action against the defendant for damages. In this action the plaintiff, among other things, claimed that this accident would have been avoided if the defendant had equipped the hammer with an appliance called an "M. S. safety device." This device, it was claimed, could be attached to the nozzle of the hammer, or gun, and would prevent the die from being projected out of the hammer by the force of its operation—the contention being that this failure of the defendant to thus equip the hammer amounted to negligence which should render the defendant liable for the injury suffered by the plaintiff.

In answer to this the defendant boiler works set up, among other things, that the hammer as used by the plaintiff at the time of his injury was such as was ordinarily used by the boiler making industry. That it was not the general custom for employers to equip their pneumatic hammers with the safety device mentioned. From this it was contended that the defendant could not be held negligent in not supplying this safety device to its hammer.

Upon the trial of the cause the trial court submitted the question of whether or not the defendant had been negligent in not supplying the safety device, to the jury. Upon the evidence, as has been outlined, the jury returned a verdict of $17,500 in favor of the plaintiff. The court required a remittitur of $5,000, and a judgment was rendered for $12,500. From this judgment the defendant prosecuted an appeal to the Supreme Court of Missouri. Here the court, after a review of the facts and an exhaustive examination of the authorities relative to the responsibility of an employer in furnishing safety devices and precautions for employees, quoted from Mather vs. Rillston, 156 U. S. 391, in part, as follows:

"Where the occupation is attended with danger to life, body, or limb it is incumbent on the promoters thereof and the employers of others thereon to take all reasonable and needed precautions to secure safety to the persons engaged in their prosecution, and for any negligence in this respect from which injury follows to the persons engaged, the promoters or employers may be held responsible and mulcted to the extent of the injury inflicted. * * *

"If an occupation attended with danger can be prosecuted by proper precautions without fatal results, such precautions must be taken by the promoters of the pursuit or employers of laborers thereon. Liability for injuries following a disregard of such precautions will otherwise be incurred, and this fact should not be lost sight of. * * * "

Following the statement of the foregoing rule, the court directed its attention to the facts of the instant case to determine whether or not it fell within the rule, and whether the trial court committed error in submitting the question of the defendant's negligence in not furnishing the safety device, to the jury. In this connection it was, among other things, said:

"Turning to the facts in this case, we find, according to plaintiff's evidence heretofore detailed, that he was directed by his foreman to hold the gun in question, and while doing so, without action or negligence upon his part, the foreman bumped against him and thereby caused the gun to be in a perpendicular position and the die to be projected so as to strike plaintiff in the eye.

"The latter's testimony shows that if the gun in question had been supplied with the M. S. guard heretofore mentioned, the injury would not have occurred; that said guard could have been furnished at a moderate cost, and used without impairing the effectiveness of the gun. Taking into consideration the facts in this case, we are of the opinion that the trial court committed no error in submitting to the jury the question as to whether defendant was in the exercise of ordinary care, in directing plaintiff to use the gun in question without it being supplied with the M. S. guard, or some other device to render it reasonably safe, if unsafe, without such guard. * * * "

In conclusion the Missouri Supreme Court affirmed the judgment for $12,500 in favor of the plaintiff, workman, rendered in the lower court. Holding, as outlined in the opinion, that the question of whether or not the defendant had used reasonable care in permitting the plaintiff to work with the hammer, in the absence of a safety device, was one for the jury; and that, as the jury had answered this question in favor of the injured workman, the judgment in his favor for the injury received would stand.

The foregoing Missouri case is obviously one of force and value on the point decided. In the light of this decision, it is clear that an employer may be running considerable risk in supplying to his employees tools which are in any way defective, or fail to have commonly known safety devices, where danger may develop in the operation of the tool without such safety devices. Truly, when the facts and holding of the case reviewed are taken together, the case is one well worth consideration by employers of mechanics and artisans in general, where the latter are furnished tools of such a nature that safety attachments may contribute to the protection of the workmen in their operation.

Power-Driven Spot Welding Machines

By H. A. Woofer
Electric Engineer, Thompson Electric Welding Co.

The present tendency in spot welding is towards power-driven, automatic machines, especially for heavy work. The reason for this is apparent. Heavy work requires heavy pressure ranging from 2,000 to 10,000 lb. per square inch to complete the weld. If this pressure must be delivered by the operator himself by means of a foot lever, he will soon grow tired; neither can he be expected to exert exactly the same pressure on each successive weld. The power driven, automatic spot welder, however, does not grow weary, and when once adjusted for pressure, current and cutout, operates continuously in exactly the same manner, making all welds identical, and leaving the operator free to handle the work only.

Ten large, power-driven, automatic spot welders, built by the Thomson Electric Welding Co., are now in operation in different classes of work. Two are used in making cutter bars for harvester and mowing machines, two in making special machinery, two in making automobile disk wheels, one in making steel burglar-proof safes, one in making paper mill machinery, one in making gear covers for railway motors, and one is used for experimental purposes in a laboratory. They are rated at 100 kva., 75 kw., and are capable of welding a maximum thickness of $\frac{3}{4}$ in. of stock. They are equipped with both a time cam cutout and a movement, or tong-type cutout. If, for any reason, the movement of the upper die is not sufficient to cut off the current before the pressure is released, the timing cam cuts it off automatically, thus preventing burning of the dies or work.

Another step in advance for the past year, is the development of a small but very powerful spot welder, rated at 25 kva., 20 kw., which may be either foot or power operated and has a maximum capacity of $\frac{3}{8}$ in. thickness of steel, or $\frac{1}{2}$ in. thickness of brass or aluminum.

From a paper read before Boston Section, American Welding Society, Oct. 1923.

Some Suggestions for Builders and Users of Machine Tools

By Thomas Nadin
General superintendent, Rolls-Royce of America, Inc., Springfield, Mass.

Inefficient lubrication of bearings and cutting tools—Systems for supplying lubricant sometimes could be better as to channels, guards and filters—Necessity for ball and roller bearings

THE objects of this paper are to point out to the builders and the users of machine tools a number of extremely simple and obvious defects in many present-day production machine-tools, and to offer some constructive suggestions for their elimination. The defects, however, are so simple that an analysis of the troubles automatically suggests the cure; they are deemed worthy of attention because of the expense required to keep the machines on which they are present in operation, and also because of the lost time and consequent interference with production that repairing them entails.

The points to which attention is directed may be classified under two heads:

(1) More thorough and more automatic lubrication
(2) Better cutting-lubricant systems

Taking up the first point, we all are familiar with the bearing that consists of a hole drilled and reamed in a cast-iron boss in which a shaft revolves. For lubricating this bearing, a small hole is often drilled, which is sometimes provided with a cover. Such a bearing, if properly proportioned is, of course, suitable for low-speed intermittent work, but to employ such a bearing for constant running at medium speeds, is obviously wrong, and must result in either a large expenditure of time and oil, or a frequent renewal of the shaft or the bearing surface. Under present-day conditions, it is very difficult to find operators that will spend the time necessary to keep the lubrication satisfactory; so it usually means that a greater amount of money and time are spent in renewal and repair. This kind of bearing is commonly used in loose pulleys, and is probably one of the biggest wasters of time in a factory. It is used in many positions on a great number of machines.

Remedies for Poor Lubrication

A remedy for such a trouble in stationary bearings would be the use of a felt pad of liberal size on the lower side of the bearing. The pad may be cylindrical in form and kept in contact with the shaft by a spring. If the bearing has an open end, it should be protected by an oil-tight cover to exclude dust and retain the oil, and means should be provided for returning the oil to the reservoir in which the felt pad is located. The other end should be provided with a cover closely fitting the shaft, and means provided for returning the used oil to the central reservoir. Such a scheme is in common use on small motors, and works very satisfactorily. With this construction, it would be necessary to oil the bearing only once a week instead of daily.

A still better construction would be to make use of a self-oiling bearing similar to those used on electric motors and lineshafts, or to use a roller bearing, or a ball bearing. In this case also, the retention of the lubricant and the exclusion of dirt are of the greatest importance. Such bearings do not require attention more than once a month for ring-oiling bearings, or once every six months for ball or roller bearings.

Use of Roller Bearings

For loose pulleys and similar running bearings, the problem requires different treatment to obtain a satisfactory solution, and use should be made of roller bearings for slow and medium speeds, or single-row ball bearings for higher speeds. Such bearings, however, require careful design to give satisfactory results. By careful design I do not mean expensive production methods, but rather the incorporation into them of correct principles. For a ball or a roller bearing to work properly, it is necessary to exclude dirt and water or cutting compound absolutely, and to retain a certain amount of lubricant, preferably heavy mineral oil and not cup grease, which is liable to dry out. If such conditions are fulfilled, loose pulleys will run for 6 months with one filling with lubricant, and without wear or expense for attention of any kind. If we assume that an ordinary loose pulley or clutch is oiled every other day, for 300 working days per year, and the average time of oiling in only 3 min., we shall have 450 min. per year expended, without counting the time of repairs or the cost of the oil. The saving of this time alone would pay a good dividend on the extra cost of a ball or a roller bearing.

The question of the exclusion of dirt, water and the like from ball or roller bearings is of supreme importance, and ranks equally with the retention of the lubricant. These points cannot be too carefully attended to and will amply repay such care as may be given them. Most of the ball-bearing makers publish a collection of sectional elevations showing the application of their bearings to various machines, but for some reason a large number of ball bearings are used every year without the simple and inexpensive features for excluding dirt and moisture, and retaining oil that are so necessary for success.

The second point that I should like to discuss deals with the cutting compound, or oiling system for machine tools, and is perhaps simpler of solution than the first.

Presented at the annual meeting of the Society of Automotive Engineers, Detroit, Jan. 22 to 25.

It is just as important from the point of view of production. Most modern machines are provided with a more or less complete system for storing a supply of compound or oil, a pump and piping for delivering it to the point of contact between the work and the tool and means for returning the compound to the storage tank. The pumps are usually of sufficient size to give a proper stream, but the guards and channels, more often than not, are insufficient to take care of the splash and the return. The filter is often of microscopic size and very soon becomes choked. The operator cleans it once or twice after the lubricant supply has failed, and then, in desperation, removes or pierces the filtering medium. From that time on, the destruction of the pump, control cocks on the pipes and any joints that are required to move proceeds rapidly by the cutting action of the chips carried in the compound or oil. On automatic machines, working constantly, it has been common to find a pump unusable from this cause after 2 weeks. The destruction, unfortunately, goes much farther than this.

In machines using oil and improperly guarded, we find the spindle bearings, the slides and the screws all badly worn, because of the presence of so much solid matter in the cutting oil. Guards for the splash and the slides are for the most part inadequate, and it seems almost a matter of course to bring in a sheet-metal worker and have him fit some clumsy, unsightly and troublesome splash-guards as soon as a machine has been installed. The channels for catching and returning the lubricant are often very poor and sometimes incomplete, requiring the use of putty or rags to ensure the compound's going the right way. Drilling machines and some milling machines are particular offenders in this respect.

The Construction of Tanks

Tanks often have the appearance of being the result of an accident rather than of careful design and in many cases serve as a storage space for chips. From the designers' and the builders' points of view, the remedy is comparatively simple. The tank itself should be of liberal dimensions and preferably be divided into two sections. The first section should receive the compound from the channels or the trays of the machine and should act as a settling tank. The compound should flow out of the first tank over a weir into the second tank, in which the pump suction and the filter are located. The tank should be deep, with a small cross-section, rather than shallow with a large dust-collecting and evaporating surface exposed to the shop. Chips and swarf should be carefully kept out of the compound tank, and the trays and the channels should be well sloped to drain the compound back.

The filter on the pump suction should be substantial in construction, with the gauze well protected, and have a filtering area of approximately 1 sq. ft. It should be easily accessible and removable and should be placed with the main area of the gauze horizontal with the suction above, so that chips and dirt will fall away from it by gravity to the bottom of the tank.

Guards of substantial construction and of ample size for protecting the slides, the bearings and the screws of the machines should be fitted. Other guards are also required to control the splash from the rotating work or tools. They should all be of sufficient size to deal with the maximum flow at the maximum working speed without allowing the compound to reach the operator or the floor. The same remarks apply to return channels and pipes. Rubber connections should not be used for compound, as they invariably become soft and useless after a short time. Flexible metallic hose, of adequate size, with sound joints, should be used instead.

It is hoped these suggestions made for overcoming some of the troubles may be of interest to some builders and suppliers of machines. The purchasers and the users of tools in which these defects are present can have the faults corrected if they will demand machines in which the troubles are absent and refuse to order machines in which they have not been eliminated. The use of machines equipped in accordance with these suggestions should result in a reduction in the labor costs for attention and repairs, cleaner machines, a reduction in accidents and the lost time involved by reducing the period of the hazard and a corresponding increase in production.

Teach Your Boy a Trade—Discussion

By Entropy

In the discussion of the subject named above, on page 874, Vol. 59, of the *American Machinist*, Lawrence F. Swenson says that in his opinion one of the reasons why boys do not go into the machinist trade is because they can get much more in the building trades. Anyone who has tried to get boys to learn any of the building trades will disagree with him. It is almost impossible to get boys to try to learn any of them, with the possible exception of carpentry.

Some ten years and more of experience with boys in trade school and in shops, has made me believe that boys are actuated in their choice of a vocation by several reasons which have little connection with the trades. In the first place, boys go to school with girls, and they are influenced altogether too much by the girls. They want to go into some kind of work where they will continue to meet the girls during business hours. Hence the large number who become clerks in stores, or who go into offices to work for equally small pay. They do not want to get their hands so soiled (dirty) that they cannot be made immaculate at night when the dancing begins.

Then there is father and mother. We might change the school system and send the boys to one school and the girls to another, but father and mother are still with us, and apparently will be for a number of years to come. Mother is another girl, a little older but with much the same idea. Father has always worked hard for a living. He has seen, or thought he saw, other men get rich without labor. He wants his boy to get rich without so much hard work. Consequently, father is in favor of a commercial education. The boy will then be an executive, a business man, perhaps a professional man, a banker, or possibly a salesman.

If father's guess is all wrong and the boy is kicked out of commercial school then there is plenty of time to consider making him a mere mechanic.

These things can all be cured. It is merely a question of swinging popular sentiment toward the trades. It is too easy for the public to forget that the big men whom it worships, began, many of them, at a trade. It sees only the successful lawyers and other professional men; it does not notice the men who graduated, even with honors, and never earned a living.

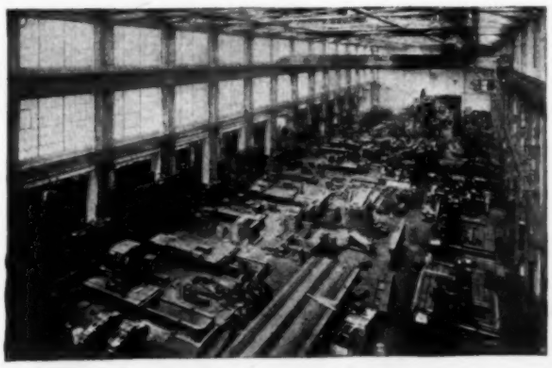
Propaganda is what we need; not in the trade papers but in the daily press. We need someone to be constantly showing the public by means of short, easily read articles that the trades have graduated a large proportion of the successful men of today.

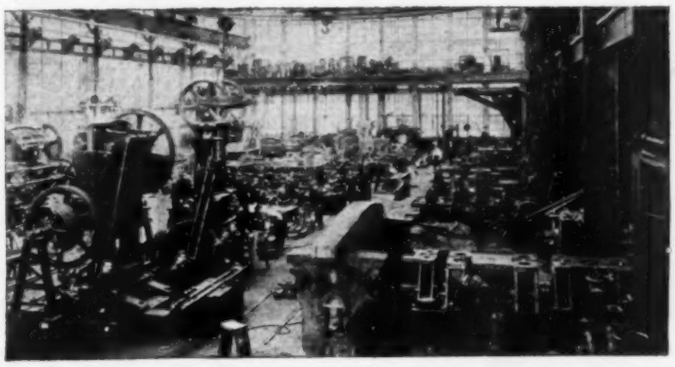
Where Machine Tools Are Made

E. W. Bliss Company

Founded 1857

Brooklyn, N. Y.—Cleveland, Ohio—Salem, Ohio—Hastings, Mich.





Using Machinery in Making Pianos

Baldwin Piano Company
Cincinnati, Ohio

Fig. 1
Making Actions

Fig. 2
Pinning Action Parts

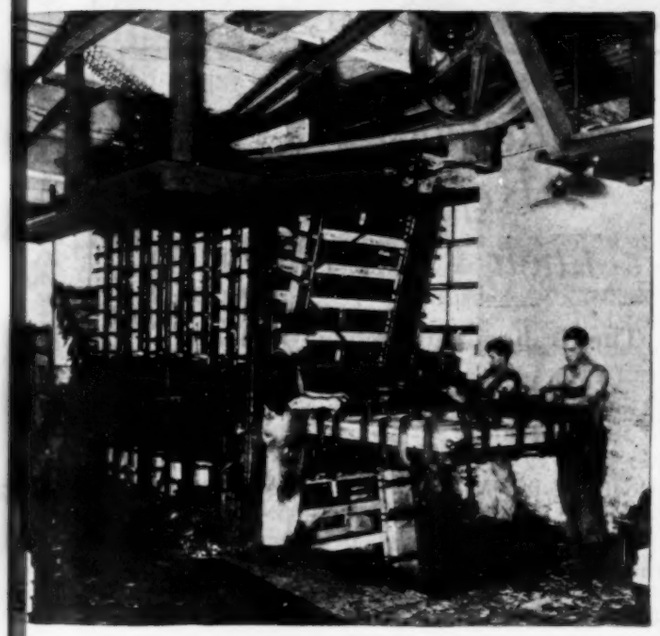
Fig. 3
Making Bass Strings

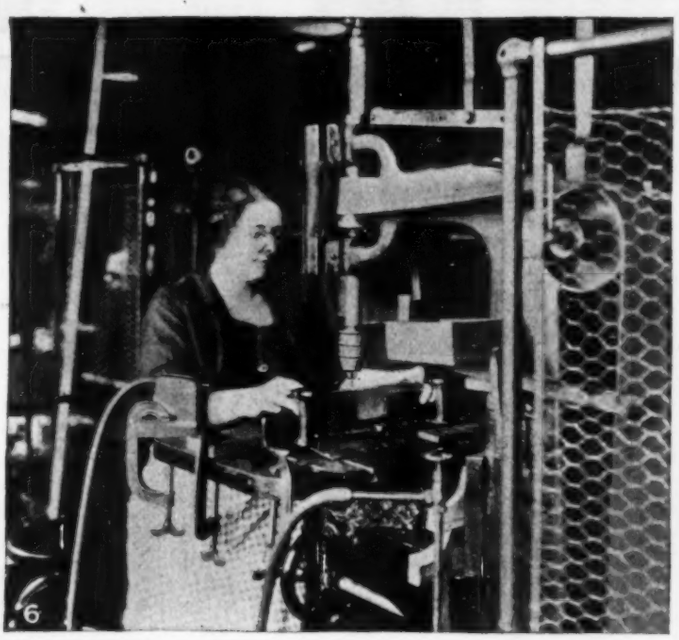
Fig. 4
Hammer Department

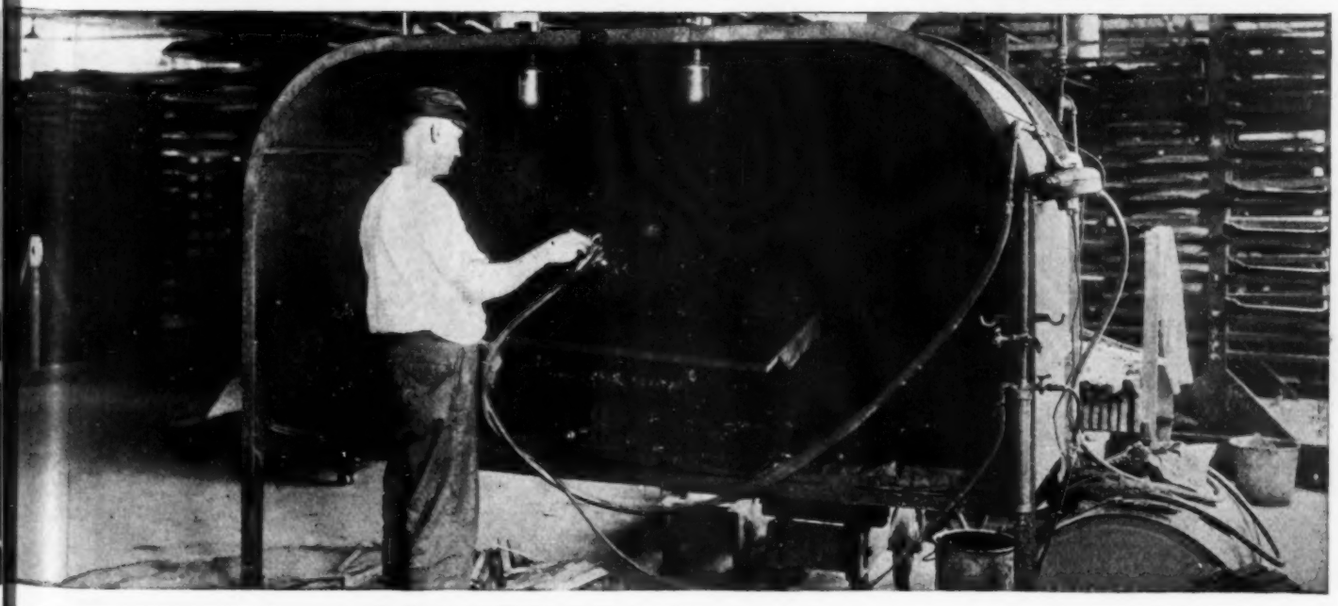
Fig. 5
Back-Making Machine

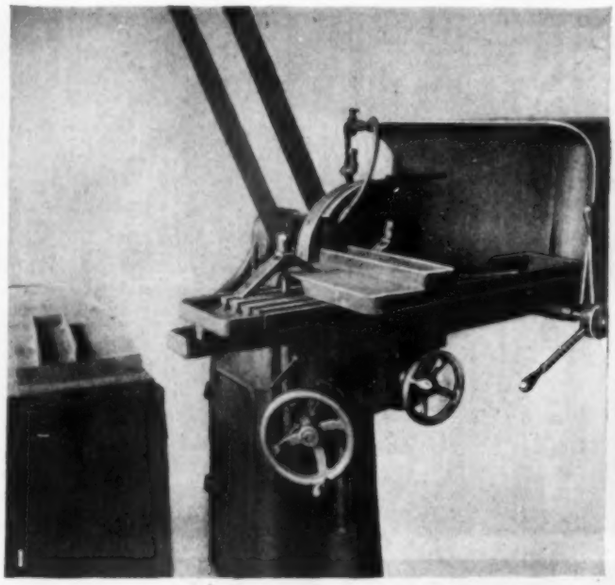
Fig. 6
Drilling Player Action Parts

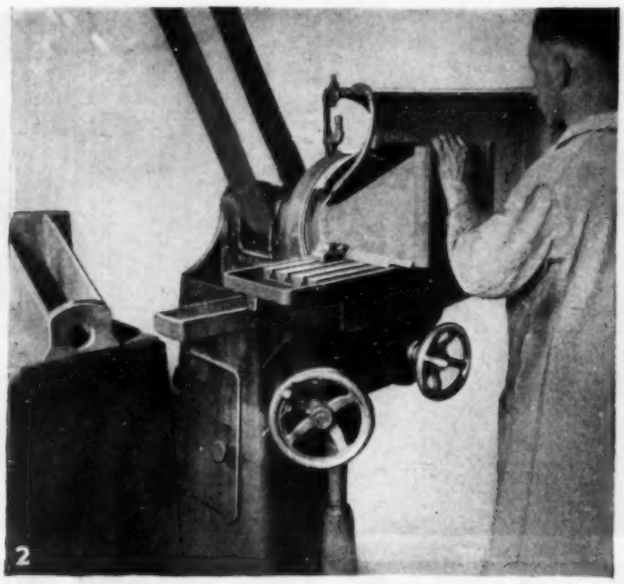
Fig. 7—Spray Varnishing

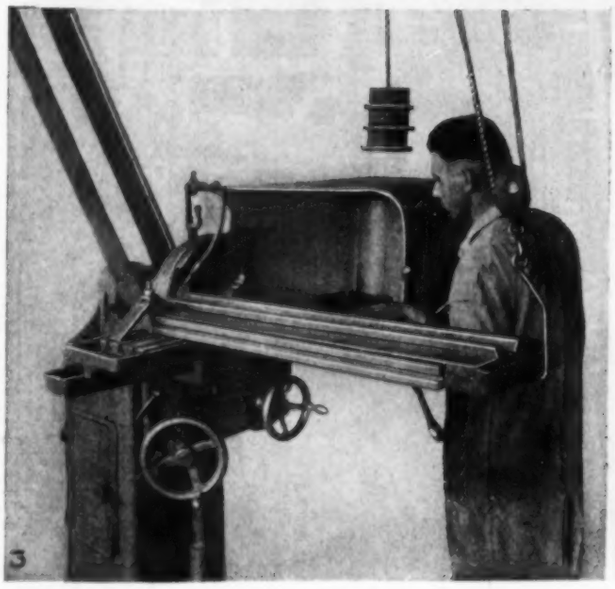












Machines That Reproduce Their Own Parts

The Graham Ring-Wheel Grinder

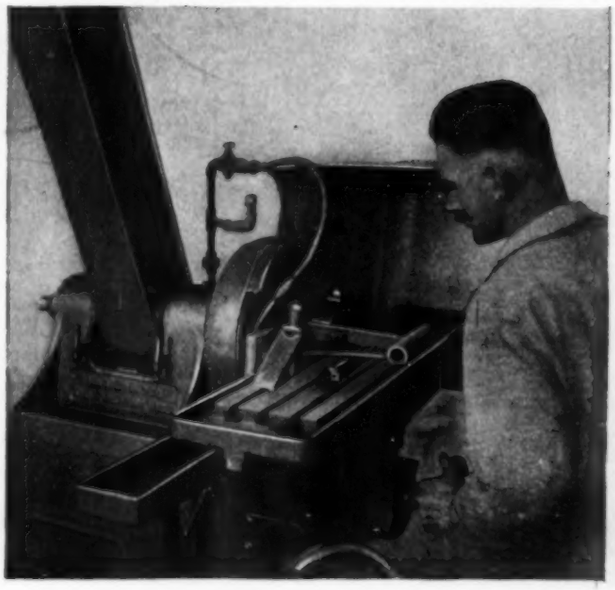
Fig. 1
Grinding End of Splash Pan

Fig. 2
Grinding Outer Face of Knee Casting

Fig. 3
Grinding End of Table

Fig. 4
Grinding Pilot-Wheel Bracket

Fig. 5
Grinding Periphery of Water Guard



Standardizing Tolerances for Taps

By Walter Daley

An analysis of the limits and tolerances adopted by the Tap and Die Institute—Table showing the progression of tolerances for all practical diameters and pitches

BEGINNING on page 883, Vol. 57, of the *American Machinist*, there appeared a set of tables giving the limits and tolerances of hand, tapper and machine-screw taps, as standardized by the Tap and Die Institute. These tables must have been carefully and thoughtfully prepared, for I have checked them over and find but one place where they are inconsistent. The rules I followed for checking are as follows:

(1). Limits and tolerances must increase as the tap diameters increase.

(2). Limits and tolerances must increase as the number of threads per inch decrease.

(3). Limits and tolerances of nut and tapper taps must be greater than for hand taps.

(4). Limits and tolerances on outside diameters must be greater than those on the pitch diameters.

The values given in Table I herewith were taken from the tables of the Tap and Die Institute, and they show that the limits on the outside diameter are greater than on the pitch diameter in every case, which satisfies rule (4). The table shows also that the limits on the outside and pitch diameters of tapper taps are greater than the limits on the outside and pitch diameters, respectively, of hand taps, thus fitting rule (3).

Inasmuch as the number of threads per inch which is used and specified in shop practice everywhere for any given diameter is progressive from a fine to a coarse pitch, rules (1) and (2) seem to conflict and oppose each other. The grouping of diameters, each with a complete practical range of pitches, as shown in the table, makes it possible to determine how the values follow out rules (1) and (2).

To make this matter clear, see Table II, showing threads per inch from 20 to 23, the values being taken from Table I. You will find the limits and tolerances to be progressive for each range of diameters in the first three columns. This particular range of threads per inch was selected and detailed to show the only inconsistency in the entire work, as the figures set in heavy type in the fourth column are not progressive for each range of diameters. The condition comes about through the standards already adopted, and thus it was impossible for me to iron it out in the table.

Now is the time to correct this bad spot, which shows at the same time the need of co-operation between standardizing bodies. The Society of Automotive Engineers is responsible for the values just referred to, it seems, as the limits specified are for the pitch diameters of the $\frac{7}{16}$-20 and $\frac{1}{2}$-20 tapper taps. The figures are 0.0010 and 0.0035 in. to be added to the basic pitch diameter to give the minimum and maximum limits, respectively, with a tolerance of 0.0025 inch.

The $\frac{1}{4}$-20 U.S.S. tapper tap limits on pitch diameter are 0.0015 and 0.0040 in. to add to the basic diameter, with a tolerance of 0.0025 in., so that the small $\frac{1}{4}$-in. tap has greater limits than a $\frac{7}{16}$ or $\frac{1}{2}$ in. tapper tap of the same number of threads per inch.

It seems to be the existing policy to let each one of the numerous manufacturers establish a standard; and then, after it has been firmly established, someone tries to adopt a national or engineering standard and naturally finds much opposition regardless of the merits of the standards. In many cases standards can be adopted before they are urgently needed. I have reference to standards for square and other threads.

This criticism applies even to the tables of limits already adopted as standard by the Tap and Die Institute. The tables are accompanied by an awkward phrase which reads "Taps with pitch coarser than S.A.E. Standard will take U.S. Standard tolerances. Those with pitch finer than S.A.E. Standard will take S.A.E. Standard tolerances." How poorly this rule covers the entire field of practical threads in daily use can be seen by asking a few questions:

What limits on taps with diameters less than $\frac{1}{4}$ in. for any given pitch?

What limits on taps with diameters over S.A.E. sizes for any given pitch?

What limits on intermediate diameters not listed for any given pitch?

What limits for a $\frac{11}{16}$ in.-12 P.I. tap which is listed under S.A.E. only? Shall they follow the $\frac{5}{8}$ or $\frac{3}{4}$ in. U.S.S. tap?

Shall the $1\frac{1}{8}$ in.-40 P.I., U.S.F. tap have the same limits as a $1\frac{1}{4}$ in.-12 P.I., S.A.E., U.S.F., tap?

How absurd!

In adopting standards it is often quite easy to cover the entire practical field without much extra trouble or expense, as shown by the accompanying Table I, where all the foregoing questions are answered.

The limits and tolerances for taps which conform to the A.S.M.E. standard are also given in the table. They too, are inconsistent with the other two standards for the pitches given, and therefore the diameters only are tabulated. The limits which conform to the machine screw standard practice, as given in the table for definite number sizes or diameters apply to any standard pitch.

The figures in bold-faced type in the table agree with the present existing standards as previously published, and at the same time the rest of the work is carried along to harmonize with those standards. The only exception is that there has not been a standard adopted for the A.S.M.E. tapper taps, to my knowledge.

Table I—Limits and Tolerances of Taps for a Complete Practical Range of Diameters and Pitches

Tap Diam., Inches	T.P.I.	Hand Taps, Etc.						Nut and Tapper Taps						A. S. M. E.
		O. Dia.			P. Dia.			O. Dia.			P. Dia.			
		Min.	Max.	Tol.	Min.	Max.	Tol.	Min.	Max.	Tol.	Min.	Max.	Tol.	
1/32 not inc. 3/64	50–99	0.0005	0.0020	0.0015	0.0005	0.0015	0.0010	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	.....
3/64 not inc. 1/16	50–99	**0.0010**	**0.0025**	**0.0015**	**0.0005**	**0.0015**	**0.0010**	**0.0015**	**0.0040**	**0.0025**	**0.0010**	**0.0030**	**0.0020**	**0–3**
	24–49	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0015	0.0040	0.0025	0.0010	0.0030	0.0020	.....
1/16 not inc. 1/32	50–99	0.0010	0.0025	0.0015	0.0005	0.0015	0.0010	0.0015	0.0040	0.0025	0.0010	0.0030	0.0020	.....
	24–49	**0.0010**	**0.0030**	**0.0020**	**0.0005**	**0.0020**	**0.0015**	**0.0020**	**0.0045**	**0.0025**	**0.0010**	**0.0030**	**0.0020**	**4–12**
	20–23	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0020	0.0045	0.0025	0.0010	0.0030	0.0020	.....
	16–19	0.0010	0.0035	0.0025	0.0005	0.0020	0.0015	0.0020	0.0050	0.0030	0.0010	0.0035	0.0025	.....
1/32 not inc. 5/16	50–99	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0015	0.0040	0.0025	0.0010	0.0030	0.0020	.....
	24–49	**0.0010**	**0.0035**	**0.0025**	**0.0005**	**0.0020**	**0.0015**	**0.0020**	**0.0050**	**0.0030**	**0.0010**	**0.0030**	**0.0020**	.....
	20–23	**0.0010**	**0.0035**	**0.0025**	**0.0005**	**0.0025**	**0.0020**	**0.0020**	**0.0050**	**0.0030**	**0.0015**	**0.0040**	**0.0025**	**14–24**
	16–19	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
	13–15	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
	10–12	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
5/16 not inc. 3/8	50–99	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0015	0.0045	0.0030	0.0010	0.0030	0.0020	.....
	24–49	**0.0010**	**0.0035**	**0.0025**	**0.0005**	**0.0020**	**0.0015**	**0.0020**	**0.0050**	**0.0030**	**0.0010**	**0.0030**	**0.0020**	.....
	20–23	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
	16–19	**0.0010**	**0.0035**	**0.0025**	**0.0005**	**0.0025**	**0.0020**	**0.0020**	**0.0050**	**0.0030**	**0.0015**	**0.0040**	**0.0025**	.....
	13–15	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
	10–12	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
3/8 not inc. 7/16	50–99	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0015	0.0045	0.0030	0.0010	0.0030	0.0020	.....
	24–49	**0.0010**	**0.0035**	**0.0025**	**0.0005**	**0.0020**	**0.0015**	**0.0020**	**0.0050**	**0.0030**	**0.0010**	**0.0030**	**0.0020**	.....
	20–23	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025	.....
	16–19	**0.0010**	**0.0035**	**0.0025**	**0.0005**	**0.0025**	**0.0020**	**0.0020**	**0.0050**	**0.0030**	**0.0015**	**0.0040**	**0.0025**	.....
	13–15	**0.0010**	**0.0040**	**0.0030**	**0.0005**	**0.0030**	**0.0025**	**0.0020**	**0.0060**	**0.0040**	**0.0015**	**0.0045**	**0.0030**	**26–30**
	10–12	0.0010	0.0040	0.0030	0.0005	0.0030	0.0025	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	.....
7/16 not inc. 9/16	50–99	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0015	0.0045	0.0030	0.0010	0.0030	0.0020	.....
	24–49	0.0010	0.0035	0.0025	0.0005	0.0020	0.0015	0.0020	0.0055	0.0035	0.0010	0.0035	0.0025	.....
	20–23	**0.0010**	**0.0040**	**0.0030**	**0.0005**	**0.0025**	**0.0020**	**0.0020**	**0.0060**	**0.0040**	**0.0010**	**0.0035**	**0.0025**	.....
	16–19	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0040	0.0025	.....
	13–15	**0.0010**	**0.0040**	**0.0030**	**0.0005**	**0.0030**	**0.0025**	**0.0020**	**0.0060**	**0.0040**	**0.0015**	**0.0045**	**0.0030**	.....
	10–12	0.0010	0.0040	0.0030	0.0005	0.0030	0.0025	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	.....
9/16 not inc. 11/16	24–49	0.0010	0.0035	0.0025	0.0005	0.0020	0.0015	0.0020	0.0055	0.0035	0.0015	0.0040	0.0025	.....
	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0040	0.0025	.....
	16–19	**0.0010**	**0.0040**	**0.0030**	**0.0005**	**0.0025**	**0.0020**	**0.0025**	**0.0065**	**0.0040**	**0.0015**	**0.0040**	**0.0025**	.....
	13–15	0.0010	0.0040	0.0030	0.0005	0.0030	0.0025	0.0025	0.0065	0.0040	0.0015	0.0045	0.0030	.....
	10–12	**0.0010**	**0.0040**	**0.0030**	**0.0005**	**0.0030**	**0.0025**	**0.0025**	**0.0065**	**0.0040**	**0.0020**	**0.0050**	**0.0030**	.....
	6– 9	0.0010	0.0040	0.0030	0.0005	0.0030	0.0025	0.0025	0.0065	0.0040	0.0020	0.0050	0.0030	.....
11/16 not inc. 3/4	24–49	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0055	0.0035	0.0015	0.0040	0.0025	.....
	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0040	0.0025	.....
	16–19	**0.0010**	**0.0050**	**0.0040**	**0.0005**	**0.0030**	**0.0025**	**0.0025**	**0.0070**	**0.0045**	**0.0015**	**0.0045**	**0.0030**	.....
	13–15	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0025	0.0070	0.0045	0.0015	0.0045	0.0030	.....
	10–12	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0025	0.0070	0.0045	0.0020	0.0050	0.0030	.....
	6– 9	0.0010	0.0050	0.0040	0.0005	0.0035	0.0030	0.0025	0.0070	0.0045	0.0020	0.0055	0.0035	.....
3/4 not inc. 7/8	24–49	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	.....
	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	.....
	16–19	**0.0010**	**0.0050**	**0.0040**	**0.0005**	**0.0030**	**0.0025**	**0.0025**	**0.0070**	**0.0045**	**0.0015**	**0.0045**	**0.0030**	.....
	13–15	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0025	0.0070	0.0045	0.0015	0.0045	0.0030	.....
	10–12	**0.0010**	**0.0050**	**0.0040**	**0.0005**	**0.0035**	**0.0030**	**0.0025**	**0.0070**	**0.0045**	**0.0020**	**0.0055**	**0.0035**	.....
	6– 9	0.0010	0.0050	0.0040	0.0005	0.0035	0.0030	0.0025	0.0070	0.0045	0.0020	0.0055	0.0035	.....
7/8 not inc. 1 1/8	24–49	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	.....
	20–23	0.0010	0.0045	0.0035	0.0005	0.0025	0.0020	0.0020	0.0065	0.0045	0.0015	0.0045	0.0030	.....
	16–19	**0.0010**	**0.0050**	**0.0040**	**0.0005**	**0.0030**	**0.0025**	**0.0025**	**0.0070**	**0.0045**	**0.0015**	**0.0045**	**0.0030**	.....
	13–15	**0.0010**	**0.0050**	**0.0040**	**0.0005**	**0.0030**	**0.0025**	**0.0025**	**0.0070**	**0.0045**	**0.0015**	**0.0045**	**0.0030**	.....
	10–12	0.0010	0.0050	0.0040	0.0005	0.0035	0.0030	0.0025	0.0070	0.0045	0.0020	0.0055	0.0035	.....
	6– 9	**0.0010**	**0.0050**	**0.0040**	**0.0005**	**0.0035**	**0.0030**	**0.0025**	**0.0070**	**0.0045**	**0.0020**	**0.0055**	**0.0035**	.....
	3–5½	0.0010	0.0055	0.0045	0.0005	0.0040	0.0035	0.0025	0.0075	0.0050	0.0020	0.0060	0.0040	.....
1 1/8 not inc. 1 1/4	24–49	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	.....
	20–23	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035	.....
	16–19	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0025	0.0070	0.0045	0.0015	0.0050	0.0035	.....
	13–15	0.0015	0.0055	0.0040	0.0005	0.0035	0.0030	0.0030	0.0075	0.0045	0.0020	0.0055	0.0035	.....
	10–12	**0.0015**	**0.0060**	**0.0045**	**0.0005**	**0.0035**	**0.0030**	**0.0030**	**0.0080**	**0.0050**	**0.0020**	**0.0055**	**0.0035**	.....
	6–9	**0.0015**	**0.0060**	**0.0045**	**0.0005**	**0.0040**	**0.0035**	**0.0030**	**0.0080**	**0.0050**	**0.0025**	**0.0065**	**0.0040**	.....
	3–5½	0.0015	0.0065	0.0050	0.0005	0.0045	0.0040	0.0030	0.0085	0.0055	0.0025	0.0070	0.0045	.....

NOTE:—The values given under "Min." and "Max." are to be added to the correct basic diameters to give the minimum and maximum limits, respectively.

Table I (Continued)—Limits and Tolerances of Taps for a Complete Practical Range of Diameters and Pitches

Tap Diam., Inches	T.P.I.	Hand Taps, Etc.						Nut and Tapper Taps						A.S.M.E.
		O. Dia.			P. Dia.			O. Dia.			P. Dia.			
		Min.	Max.	Tol.	Min.	Max.	Tol.	Min.	Max.	Tol.	Min.	Max.	Tol.	
1⅛ not inc. 2⅛	24–49	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030	
	20–23	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035	
	16–19	0.0010	0.0050	0.0040	0.0005	0.0035	0.0030	0.0025	0.0070	0.0045	0.0020	0.0055	0.0035	
	13–15	0.0015	0.0055	0.0040	0.0005	0.0035	0.0030	0.0030	0.0075	0.0045	0.0020	0.0055	0.0035	
	10–12	**0.0015**	**0.0060**	**0.0045**	**0.0005**	**0.0035**	**0.0030**	0.0030	0.0080	0.0050	0.0020	0.0060	0.0040	
	6– 9	0.0015	0.0065	0.0050	0.0005	0.0040	0.0035	0.0030	0.0085	0.0055	0.0025	0.0065	0.0040	
	3–5½	**0.0015**	**0.0070**	**0.0055**	**0.0010**	**0.0050**	**0.0040**	**0.0030**	**0.0090**	**0.0060**	**0.0025**	**0.0070**	**0.0045**	
2⅛ not inc. 2⅝	24–49	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0045	0.0030	
	20–23	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0060	0.0045	0.0015	0.0050	0.0035	
	16–19	0.0010	0.0050	0.0040	0.0005	0.0035	0.0030	0.0025	0.0070	0.0045	0.0020	0.0055	0.0035	
	13–15	0.0015	0.0055	0.0040	0.0050	0.0040	0.0035	0.0030	0.0080	0.0050	0.0020	0.0060	0.0040	
	10–12	**0.0015**	**0.0060**	**0.0045**	**0.0005**	**0.0040**	**0.0035**	0.0030	0.0090	0.0060	0.0025	0.0065	0.0040	
	6– 9	0.0015	0.0070	0.0055	0.0010	0.0050	0.0040	0.0035	0.0010	0.0065	0.0025	0.0070	0.0045	
	3–5½	**0.0020**	**0.0080**	**0.0060**	**0.0010**	**0.0055**	**0.0045**	**0.0040**	**0.0110**	**0.0070**	**0.0030**	**0.0080**	**0.0050**	
2⅝ not inc. 3⅛	24–49	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0045	0.0030	
	20–23	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035	
	16–19	0.0010	0.0055	0.0045	0.0005	0.0035	0.0030	0.0025	0.0075	0.0050	0.0020	0.0055	0.0035	
	13–15	0.0015	0.0060	0.0045	0.0005	0.0040	0.0035	0.0030	0.0080	0.0050	0.0020	0.0060	0.0040	
	10–12	**0.0015**	**0.0060**	**0.0045**	**0.0005**	**0.0040**	**0.0035**	0.0030	0.0090	0.0060	0.0025	0.0070	0.0045	
	6– 9	0.0015	0.0075	0.0060	0.0010	0.0050	0.0040	0.0035	0.0105	0.0070	0.0025	0.0075	0.0050	
	3–5½	**0.0020**	**0.0090**	**0.0070**	**0.0010**	**0.0060**	**0.0050**	**0.0040**	**0.0120**	**0.0080**	**0.0030**	**0.0085**	**0.0055**	
3⅛ not inc. 4⅛	24–49	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0045	0.0030	
	20–23	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0020	0.0070	0.0050	0.0015	0.0050	0.0035	
	16–19	0.0010	0.0055	0.0045	0.0005	0.0035	0.0030	0.0025	0.0080	0.0055	0.0020	0.0055	0.0035	
	13–15	0.0015	0.0060	0.0045	0.0005	0.0040	0.0035	0.0030	0.0090	0.0060	0.0020	0.0065	0.0045	
	10–12	**0.0015**	**0.0070**	**0.0055**	**0.0005**	**0.0050**	**0.0045**	0.0030	0.0110	0.0070	0.0025	0.0075	0.0050	
	6– 9	0.0015	0.0080	0.0065	0.0010	0.0055	0.0045	0.0035	0.0115	0.0080	0.0025	0.0080	0.0055	
	3–5¼	0.0020	0.0090	0.0070	0.0010	0.0060	0.0050	0.0040	0.0125	0.0085	0.0030	0.0085	0.0055	

NOTE—The values given under "Min." and "Max" are to be added to the correct basic diameters to give the minimum and maximum limits, respectively.

Table II—Method of Checking the Figures of Table I

Showing the progression of limits and tolerances for taps for the complete range of diameters with one group of pitches, and featuring the only inconsistency which exists in the master chart.

Tap Diam., Inches	T.P.I.	Hand Taps, Etc.						Nut and Tapper Taps					
		O. Dia.			P. Dia.			O. Dia.			P. Dia.		
		Min.	Max.	Tol.	Min.	Max.	Tol.	Min.	Max.	Tol.	Min.	Max.	Tol.
7/64 not inc. 7/32	20–23	0.0010	0.0030	0.0020	0.0005	0.0020	0.0015	0.0020	0.0045	0.0025	0.0010	0.0030	0.0020
7/32 not inc 5/16	20–23	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025
5/16 not inc. 3/8	20–23	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025
3/8 not inc. 7/16	20–23	0.0010	0.0035	0.0025	0.0005	0.0025	0.0020	0.0020	0.0050	0.0030	0.0015	0.0040	0.0025
7/16 not inc. 9/16	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	**0.0010**	**0.0035**	**0.0025**
9/16 not inc. 11/16	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0040	0.0025
11/16 not inc. 3/4	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0040	0.0025
3/4 not inc. 7/8	20–23	0.0010	0.0040	0.0030	0.0005	0.0025	0.0020	0.0020	0.0060	0.0040	0.0015	0.0045	0.0030
7/8 not inc. 1⅛	20–23	0.0010	0.0045	0.0035	0.0005	0.0025	0.0020	0.0020	0.0065	0.0045	0.0015	0.0045	0.0030
1⅛ not inc. 1⅜	20–23	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035
1⅜ not inc. 2⅛	20–23	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035
2⅛ not inc. 2⅝	20–23	0.0010	0.0045	0.0035	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035
2⅝ not inc. 3⅛	20–23	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0020	0.0065	0.0045	0.0015	0.0050	0.0035
3⅛ not inc. 4⅛	20–23	0.0010	0.0050	0.0040	0.0005	0.0030	0.0025	0.0020	0.0070	0.0050	0.0015	0.0050	0.0035
		Column 1			Column 2			Column 3			Column 4		

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Cold-Drawing a Steel Bottle

BY AMOS FERBER

An interesting example of cold-drawn steel shell work is the steel bottle shown in Fig. 1, which picture includes a sample from each step of the sequence, from flat plate to the finished product. The material is ordinary cold-rolled drawing steel, $\frac{1}{8}$ in. in thickness.

To the left may be seen the $10\frac{3}{4}$-in. diameter blank from which the pieces start. As a matter of fact the blank does not appear in the regular operations, for the reason that, though such a blank is cut at every stroke of the double-action press in the "blank and cup" operation, it is immediately carried out of sight by the continued movement of the tools, and when it reappears it is as represented by the cupped shell at the bottom of the stack in the picture.

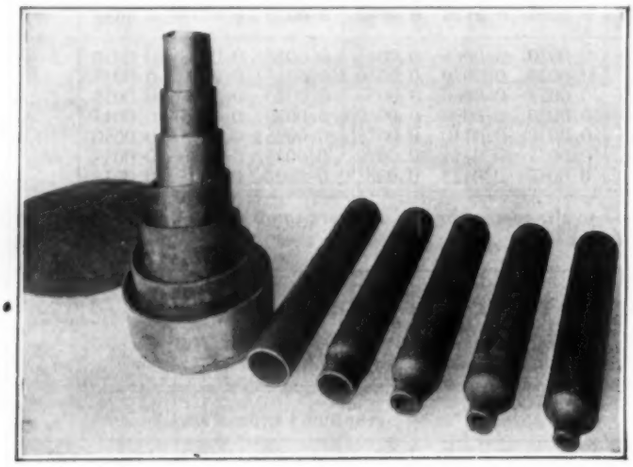


Fig. 1—The sequence of operations

The next six operations are performed in plain, open redrawing tools in single-action presses, the pieces being annealed between each draw, until the sixth operation results in the plain, round-bottomed tube shown at the top of the stack and again lying upon its side; the first such piece from the left as seen in the picture. The latter piece has been trimmed to remove the ragged edge left by the drawing tools, and to reduce the tube to standard length.

The following four operations complete the neck of the bottle. The work is all done in the single-action redrawing press shown in Fig. 2, the tools in place in this picture being for the third operation. The lower tool is a tubular-shaped die into which the bottle is set as shown in the picture at the beginning of the stroke. The bottom of the die is the movable knock-out plug, formed to fit the rounded bottom of the bottle, and is at the moment near the top of the die, as it is connected with the press gate and rises with it.

The upper tool is also a die, formed to the shape of the neck in the corresponding operation. There are four of these dies, and all are used in conjunction with the one lower die. At the center of each of the upper dies there is a short projection, rounded upon the end, to enter the neck of the bottle and prevent the metal from buckling inward when the pressure of the die is brought to bear upon it.

As the press gate descends, the first thing that happens is that the upper tool comes in contact with the partially formed bottle and, meeting with no resistance —for the knock-out plug started for the bottom of the die when the gate commenced to move—pushes it into the lower die for nearly its full length. The knock-out plug having now come to rest upon a shoulder at the bottom of the lower die, the bottle necessarily stops with a distance equal to the length of the neck projecting above the surface. Continued movement of the gate forces the upper die over the shell, flowing the metal inward as far as the plug will allow and causing the neck of the bottle to assume the shape and size of the die.

The lower die has no function other than to confine the metal of the shell against a tendency to bulge outward, the circular shape of the shell being sufficient guarantee that it will not bulge inward. As the projection at the center of the upper tool prevents the shell from folding in upon itself at the top, there is left no place for the metal to go except into the die, to the size and shape of which it must conform. That the tube may be as resistant as possible to end pressure, the annealing which intervenes between each necking operation is performed in a special furnace that heats only the end of the shell.

The bottles are to hold compressed air under a pressure of several hundred pounds. The operations are plain every-day drawing and re-drawing operations, in-

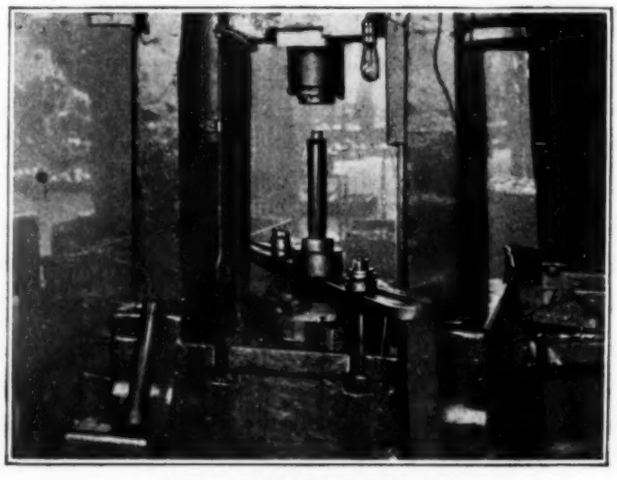


Fig. 2—Necking the bottle

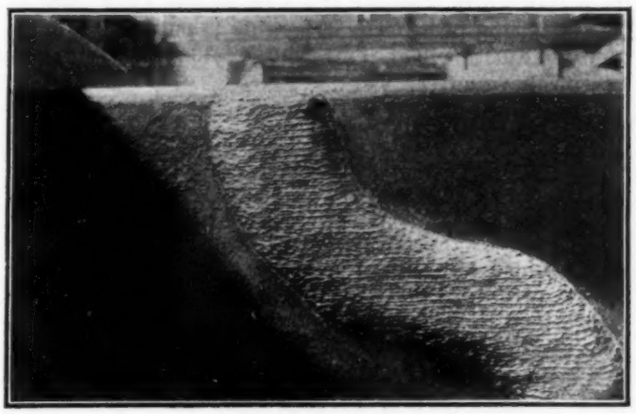
teresting principally because of the thickness of the metal and the seemingly drastic treatment it is called upon to withstand, especially in the necking operations. Any overstrain upon the metal would result in a bursted bottle in the subsequent hydrostatic test, and the fact that there are practically no failures in these tests is evidence that the engineers in charge have worked out the sequence very carefully.

The tools were designed by the Worcester Pressed Steel Co., and are in use in its factory.

Repairing a Planer Bed—A Correction

By Chester H. Franklin

Since the appearance of my letter on page 711, Vol. 59, of the *American Machinist*, on repairing a planer bed, I have learned that I was misinformed regarding the method used in making this repair. I am assured



Welding a cracked planer bed

that the welds in the planer bed were made with an arc welder, and not with an oxy-acetylene torch as stated. The work was very neatly done as can be seen by referring to the illustration.

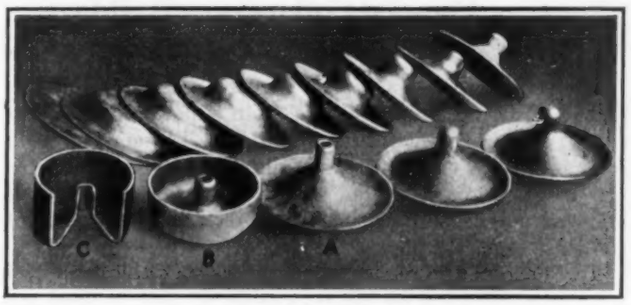
Drawing a Bowl Shell for a Separator

By Jack Williams

The nature and appearance of a machine is not always a true index of the difficulties to be encountered in its manufacture. It is not infrequently the case that the tools for making a single part will cost far more than the market value of the machine, and it is only because these tools will continue to produce the parts in large quantities at an almost negligible individual cost, that the machine can be manufactured at all.

The shell here shown is an example. It is a component of a cream separator and is drawn up from the sheet in twelve operations, including two "first-draws" in double-acting presses and ten redraws that are accomplished in a single-acting press. The material is cold drawing steel $\frac{1}{16}$ in. thick, and the piece starts from a flat blank $9\frac{1}{16}$ in. in diameter. It is subjected to but five annealings during the process.

The first operation cuts the blank from the sheet and produces the shallow basin-like shell shown on top of the sample blank at the left end of the rear row in the illustration. This is, of course, a job for a double-acting press. The nine succeeding operations



A heavy steel shell

are those of redrawing, reducing the diameter and increasing the length of the central stem to the shape shown by the second piece from the right end of the front row. None of these later operations take metal from the flange, and but three annealings are required to put the metal in condition for the punishment it has to undergo.

Starting with the annealed shell *A*, the direction of draw is reversed and the shell turned inside-out by placing it, stem upward, on a drawing die, for which the punch is tooled out to fit over the shell. This is the second operation in which a blank holder is used, and the result is shown at *B*. The final operation is a redraw, and produces the shell shown at *C*, from which a quarter-section has been sawed to observe the disposition of the metal.

Despite the drastic treatment to which the material has been subjected during this long series of operations, there is no perceptible variation in the thickness of wall.

How Hard Is Steel?—Discussion

By C. Sackett

Reading the article by Joseph Hewes under the title given above, on page 116, Vol. 60, of the *American Machinist*, reminds me that a great many years ago Henry A. Williams of the Williams Manufacturing Co., Taunton, Mass., showed me a $1\frac{1}{16}$-in. twist drill that had a peculiar looking blister on one of the lands and close to the shank. Mr. Williams wanted to know if I could tell him whether it was a flaw in the steel.

Examination under a powerful magnifying glass revealed nothing upon which to base a decision. It did, however, show the presence of some foreign substance which looked like the end of a fine wire, terminating at the surface. The drill was then suspended by a string and struck by a very light hammer. With the ear close to the point of the drill, a discordant note could be heard, indicating the presence of a flaw. It was decided to break the drill, as near as possible at the blister, and see what would be disclosed at the point of fracture.

With the drill laid on two blocks on the anvil, it took a comparatively light blow with a hammer to break it. Fortunately the drill broke almost in the middle of the blister. Examination under a magnifying glass showed a piece of hair about $\frac{3}{8}$ in. long, running radially into the drill.

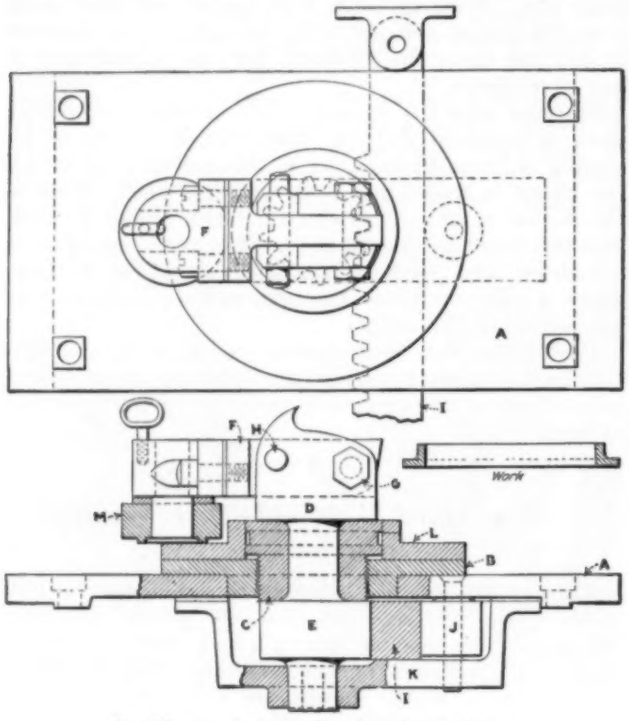
The only possible reason that the hair could exist through the heats of working the steel and of hardening, is that it was covered or incased so quickly as to be excluded from the oxygen of the air.

Bending Flanged Collars on a Bulldozer

By Cyril B. Clark

We were making a lot of flanged collars, as shown in the drawing, of two sizes, 8-in. and 8¼-in. respectively, and were wasting a lot of time in bending them by hand. As there was an idle bulldozer of suitable size in the plant, I rigged up the fixture here described and made the collars from angle iron in a fraction of the time that had been required for the hand process.

The base of the device is the plate *A*, which was cast with spotting lugs on the underside so that it need not be planed all over. The plate was fastened to the frame of the bulldozer by four holding bolts. The upper surface was planed and a hole was bored through the center to fit the flanged bushing *B*. The bushing was threaded internally to take the bearing *C*, which



Bulldozer fixture for bending rings

was made in two parts, sweated together and separated after finishing. The reason for making the bearing in this way was, that otherwise it could not have been assembled. The threaded outer surface of the bearing provides an up and down adjustment of the spindle.

The spindle *D* is a steel casting, cored through the center to relieve shrinkage strains. Advantage of the cored hole was taken in machining the piece by boring and reaming it to fit a mandrel, upon which it was finished instead of upon centers. The pinion *E* is an integral part of the spindle, and the latter terminates at its upper end in a sort of yoke in which the cross-arm *F* swings in a vertical plane about the pivot-bolt *G*. A taper pin at *H* holds the arm rigidly in a horizontal position, yet by withdrawing the pin the operator is enabled to swing the arm upright and out of the way without delay, as is necessary to remove a finished collar from the machine.

A rack *I*, meshing with the pinion *E*, and prevented from coming out of mesh by the fixed roller *J*, is attached to the ram of the bulldozer by a suitable connection. The pinion is so proportioned to the length of stroke of the bulldozer as to make a trifle more than one full revolution forward and back at each cycle. A bracket *K*, bolted to the underside of plate *A*, provides the lower bearing for the spindle.

The former *L* is attached by flush-head screws through the flanged bushing *B* to the plate. The raised shoulder of the former is of a diameter equal to the inside diameter of the collars to be made, and it must be taken off and another one substituted when collars of another size are required. A fixed pin in this former fits loosely in a drilled hole near the end of each straight piece of angle stock, and holds the latter against endwise movement during the bending operation.

The arm *F* is made in two pieces as indicated on the drawing, and is held together by two bolts. The object of this joint is to provide adjustment for the length of arm for the different diameters of work. In the joint is placed a packing piece ⅛ in. thick and several pieces of thin shimming. The ⅛-in. piece is taken out or left in, according to whether the 8-in. or the 8¼-in. size of collar is being bent. The shimming is put in to provide minute adjustment of the forming roller for greater or less pressure on the work.

The forming roller *M* turns on a stud in the arm *F* and, as readily may be seen, sweeps around the former *L* at each stroke of the bulldozer, the distance between the roller and the shoulder of *L* being adjusted to suit the thickness of the stock to be bent. The peculiar hook-shape of the upper end of the spindle serves the purpose of holding the arm up out of the way by means of the taper pin *H*, the latter being withdrawn from its normal position and reinserted in the hole in the arm after the latter has been raised by the operator.

As the bulldozer makes a complete cycle in about three seconds, it may be seen that the output of the device depends largely upon the ability of the operator to get the finished rings out and insert new pieces of stock.

A Swaging Operation in a Screw Machine

By James McCall

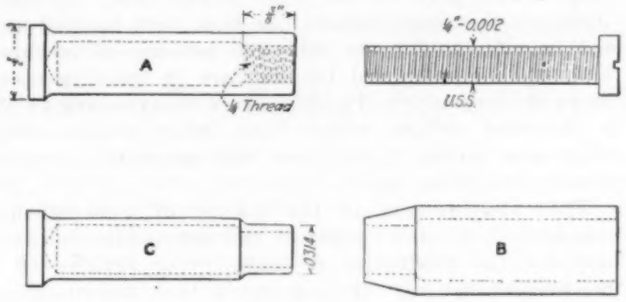
The method adopted for producing the piece shown at *A* in the sketch is somewhat unusual and may be of interest to the readers of the *American Machinist*. The parts were wanted in quantities and were of four different lengths, ranging from 1½ in. to 3 in. under the head, but all were of the same dimensions in other respects. A central hole extended from the outer end to within ⅛ in. of coming through at the shouldered end. A ¼-in. internal thread was required at the outer end for a distance of ⅜ in. only; the remainder of the hole being full ¼ in. diameter to clear the threads of the screw.

The pieces were made on a small hand screw-machine, the material being ½-in. round brass rod. The first tool in the turret was a straight fluted ¼-in. drill, with which the hole was drilled to the required depth. The next tool was a hollow mill which roughed down the stock to a diameter of 0.362 in., and left a generous fillet under the head. The length of the piece was left a trifle short of the finish requirements in this operation, as the following operations were likely to increase it slightly.

Next followed two similar operations with tools like that shown at *B* in the sketch, the only difference be-

tween them being in the size of the hole in the outer end. The first of these tools swaged the end of the piece to a diameter of 0.338 in. followed immediately by the second swaging tool which left the piece as shown at *C* with a diameter of 0.314 in. at the end.

The portion of the hole thus reduced in diameter by the swaging tools was then tapped. A full depth



The work and one of the swaging tools

of thread was not essential and we were satisfied with 75 per cent of a full thread. The screw was made 0.002 in. undersize to insure clearance in the chambered hole.

The final operation, previous to cutting off, was performed with a second hollow mill which reduced the piece to a uniform diameter of 0.3125 in. over its length and left a square shoulder under the head at the correct distance from the outer end.

Special Arbor for Fly-Cutters

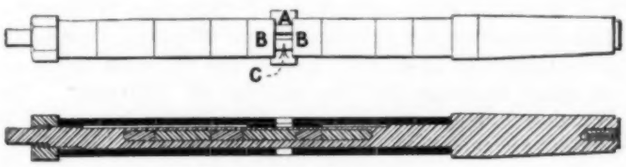
By A. E. Gruber

As we are located in a district somewhat remote from the manufacturing centers we are forced to wait, sometimes for a long time, for special tools and parts, and we therefore are compelled to resort to many makeshift devices in order to obviate the necessity for enforced idleness of any of our machines.

Bevel gears, sprockets, etc., are among the parts that need to be replaced, and I have designed the special boring bar shown in the accompanying sketch to go in our No. 4 Cincinnati miller to hold fly-cutters of various sorts in whatever position may be most advantageous to the work of cutting such parts.

The feature of the bar is the long slot, extending over the greater part of the length of the bar, and two collars with a rectangular shaped notch across the face of each to match the thickness of the stock used to make the cutters.

The slot is filled with hardened and ground filling



Arbor for fly-cutters

pieces of different widths, and when a cutter is to be put in, enough of the fillers are taken out to accommodate it. The slotted collars are then brought up, one on each side of the cutter, the plain collars slipped on the outer end, and the nut tightened.

Filling Scores in Cylinders

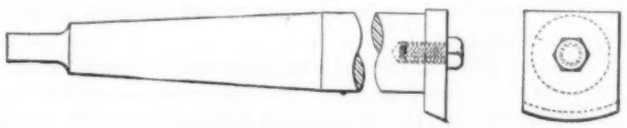
By George Wilson

The scoring of gasoline engine cylinders is caused principally by the loosening of the piston pin fastening, which allows the pin to come in contact with the cylinder walls. Reboring or grinding, and putting in new oversize rings and pistons is a common way to repair such a case, where refinishing facilities are available. Another method is dovetailing the scores and filling with metal mechanically, which is done only by experienced specialists.

However the soldering method can be done by most any one who will devote a little time to practicing it, and the results are entirely satisfactory if properly done. The solder used is sold under various names and is used the same as ordinary soft solder. The scores must be scraped clean and bright. A good flux is C. P. hydrochloric acid in which has been dissolved all the zinc it will take up. It is a good plan to wash the cleaned scores with the straight acid first, then apply the zinc solution.

As the solder melts at a higher heat than soft solder, a good sized soldering copper should be used, as large as can be conveniently worked in the cylinder. It will be necessary to heat the copper almost red. Warming the casting will help materially in the flowing of the solder. The operator must be content with rather slow progress in filling in the solder, with frequent trips to the fire, or using several coppers. It is better to clean all soft solder from the copper and re-tin with the harder solder. Sal ammoniac used in the usual way will do.

Having filled in the score with enough solder to



Tool for shaping solder

allow finishing down to the proper level, the next step is to remove the surplus solder and leave a smooth surface true with the rest of the cylinder wall. If too much solder is removed the cure will not be much better than the disease.

Scraping and filing the hard solder down to a proper level, especially when the score is the width of a one-inch piston pin is quite a job and can consume a lot of time and patience. We tried various machining stunts to remove the surplus solder, but found it too risky, as it is practically impossible to remove the right amount of metal without cutting the cylinder wall. However, the tool here shown finally solved the problem and a drill press was the only machine required.

The tool consists of a shank to fit the drill-press spindle, and at the lower end a cutter having the same radius as the cylinder bore. The cutter is made wider than the score.

In use the tool is moved up and down with the feed lever of the press, the action being that of a slotter. A slot in the cutter permits its being fed up to the cut as the metal is planed away. The cutter is fed in until it strikes the cylinder wall on each side of the score. To prevent injury to the wall the cutter is left soft, and will readily cut the softer solder but not the cylinder.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

February 7, 1924

Burning the Charts of Business Navigators

ECONOMIC statistics of various sorts have often been referred to as the guiding charts of the commercial skippers who navigate the perilous seas of business. Marine navigation has long since emerged from the state where every voyage was an exploring trip of no mean proportions. Most of the navigable waters have been thoroughly charted and the captain of an ocean-going craft of any size can tell pretty well where he is going and what he will meet along the way. Without his charts he would have to depend solely upon his previous experience along given trade routes, and he would be little better off than the navigators of the time of Christopher Columbus and Hendrik Hudson.

The business navigator has only recently struggled out of the Hendrik Hudson class so far as complete knowledge of the course he expects to travel is concerned. Even today the information available to the average business executive is distressingly inadequate. Some industries are much better equipped than others, but the best of them must always calculate on a large factor of chance.

Leading economists of the type of Herbert Hoover have been preaching the need for more complete information on which the business man can base his plans, and Mr. Hoover, at least, has done something to secure the information. And now the Department of Justice maintains that, because statistics may be abused by the lawless, they shall not be available to the law abiding. Its attitude is much like that of a government which would destroy all lighthouses and abolish all charts because smugglers or rum runners might use them to land their cargoes safely. What does it matter if the many times larger bulk of legitimate business or legitimate commerce is wrecked so long as the few law breakers are apprehended or prevented from carrying out their evil plans?

Better Work at Lower Costs in Automobile Industry

THE CHANGES which have taken place in automobiles during the past ten or fifteen years have been many and some of them rather startling. But fully as many radical changes have taken place in the methods of manufacture and in the quality of workmanship as in the design of motors and bodies.

The ever-increasing demand for automobiles has compelled the designing of new machine tools, new cutting tools, new and better gages and gaging fixtures. New methods of securing increased production at lower costs have enabled the prices to be lowered, thus greatly increasing the market.

With all the straining for increased production, however, it is gratifying to notice that in many cases the quality of workmanship has improved rather than deteriorated, even on the lower priced cars. In some instances this improvement has been very marked and speaks volumes for the skill and patience of machine and tool designers and for the care in training operators and inspectors. There are cars today selling below a thousand dollars, which have better workmanship than cars costing three times that amount a comparatively few years ago.

This improvement in the quality of workmanship speaks well for the future of the automobile industry and for the production of many other articles of a mechanical nature. It also shows that the machine-building industries are not losing the cunning which has made them famous in the years gone by. We are replacing much hand work and skill by machinery and machine methods, but we are securing better results in many cases and making it possible for more men to earn better wages than ever before.

The automobile industry is showing us the way to produce better machinery at lower costs when the quantity is sufficient to allow the methods necessary in mass production.

The Precarious Tenure of Commercial Attachés

THERE IS no question that the commercial attachés of the Department of Commerce are doing a fine job for American business abroad. Almost any business man who has much foreign business can give instances of valuable services performed by these men. Ever since the inauguration of the commercial attaché service, however, they have held office from year to year depending upon the inclusion in the Department of Commerce appropriation of the amount needed to cover their salaries and expenses.

More than once it has been necessary to indulge in violent political gymnastics at the last moment to keep their appropriation from falling by the wayside. The natural result of this precarious situation has been to affect adversely the morale of the service. Any salaried man always faces the possibility of being separated from his job through failure to make good at it. But it is seldom that he has to consider the chance every year that the job itself will suddenly vanish into thin air.

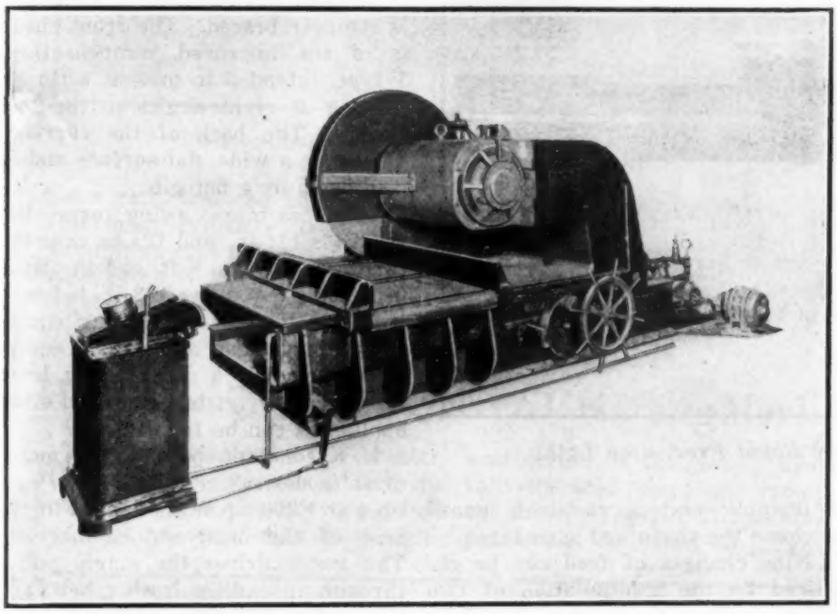
A bill to remedy the trouble has been introduced into the House of Representatives by Chairman Winslow of the Committee on Interstate and Foreign Commerce. It is known as H.R. 4517 and is due to reach the stage of open hearings by the middle of February. The Winslow bill deserves support from those interested in the advancement of our foreign trade.

Congress shows signs of becoming more reasonable about tax reduction. But the key to the whole situation, the lowering of high surtaxes to release capital for productive industry, is up against determined opposition. Keep after your Congressmen but don't use form letters.

Shop Equipment News

Ryerson No. 5 High-Speed Friction Saw

An addition to the line of high-speed friction saws, manufactured by Joseph T. Ryerson & Son, Inc., Chicago, Ill., and described on page 38, Vol. 54, of the *American Machinist*, consists of a No. 5 size. This is a larger machine than those previously manufactured and has been developed for heavy duty in large shops which handle the largest sections rolled.



Ryerson No. 5 High-speed Friction Saw

The blade of this saw is 61 in. in diameter and ⅜ in. thick, and is driven by a 125-hp. motor. The general design of the machine is similar to the smaller sizes, having a heavy box-section base, upon which the carriage, bearing the saw and its driving motor, is mounted on rollers.

The saw is covered by a large hood, one section of which is hinged to facilitate inspection or removal. The clearance under the hood and flanges is 14¾ in. The saw is a soft-steel disk, hollow ground on its sides and nicked on the edge to increase the friction. In operation the blade is cooled by jets of water.

Two levers, mounted on a control box which may be located where most convenient, are used to operate the machine. One lever controls the water supply for cooling the saw and the other operates the feeding mechanism. The saw may be fed by hand or by an automatic hydro-electric device. A voltmeter and an ammeter are mounted on the control box so that the operator will know the load on the saw at all times.

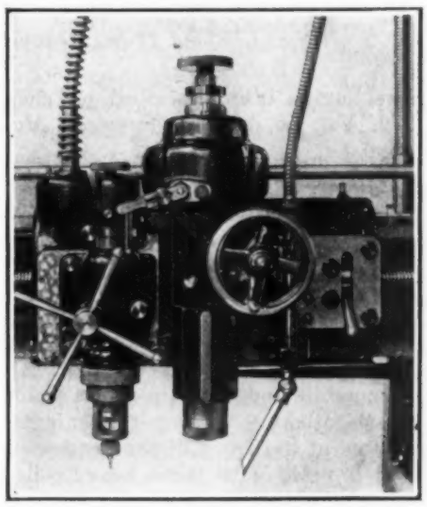
Société Genevoise Drilling Attachment for Small Holes

An attachment for drilling small holes has recently been developed by the Société Genevoise for the larger sizes of its jig boring machine, described on page 385, Vol. 59, of the *American Machinist*. These machines are being marketed by the R. Y. Ferner Co., 1410 H St., N.W., Washington, D. C. The use of this attachment avoids the necessity for removing large jigs, in which small holes are required, to smaller machines for drilling holes less than ¼ in. in diameter.

The special drilling spindle is mounted in the same slide with the main boring spindle and at a fixed distance from it. The two spindles are exactly parallel, and are shown in the accompanying illustration, the small drilling spindle being located at the left. It is driven by a flexible shaft connected to the driving mechanism of the machine through a friction clutch, and may be run at 2,000 r.p.m. maximum speed.

The vertical travel of the spindle is 1.6 in., and is controlled by a handwheel which operates through a rack and pinion. A vertical scale attached to the spindle mounting is provided to measure the movement of the tool, and an index point mounted on an adjustable ring may be set to limit the movement.

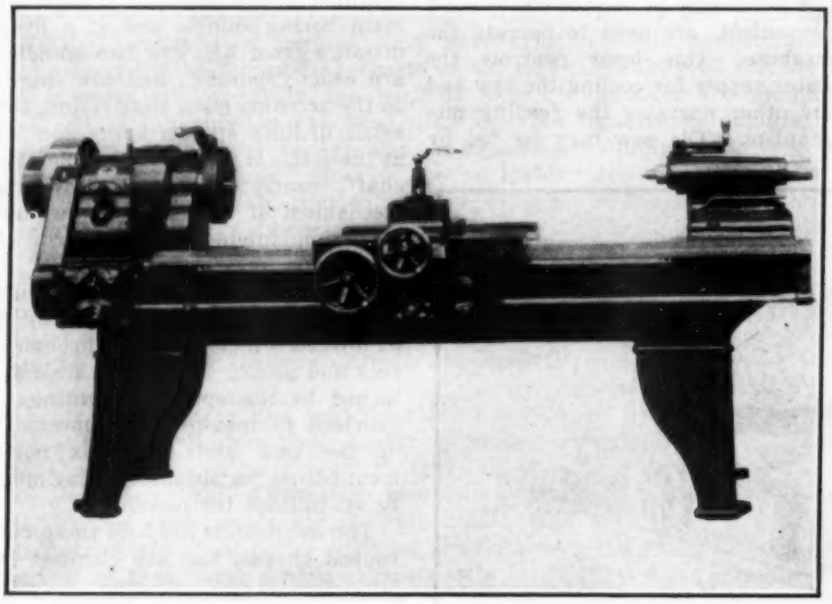
The small drills are held in special conical chucks, and are clamped by means of a milled head at the top of the spindle. In order to prevent these small drills from vibrating at high speeds, a guide has been provided in the form of a hardened bushing with a conical point. The bushing holds the drill within close limits. Three sets of special chucks and guides are regularly furnished.



Societe Genevoise Drilling Attachment

LeBlond 17-In. Heavy-Duty Rapid Production Lathe

The R. K. LeBlond Machine Tool Co,. Cincinnati, Ohio, has recently added to its line of heavy-duty, rapid production lathes, the 17-in. size shown in the accompanying illustration. In general design and construction this lathe is similar to other models of the series, the 11-in. size having been described on page 979, Vol. 56, of the *American Machinist*.



LeBlond 17-in. Heavy-Duty Rapid Production Lathe

The headstock is of the selective-speed, geared type, and is driven by a single belt pulley 14 in. in diameter. Six changes of spindle speed are provided, ranging from 50 to 250 r.p.m., and can be obtained independently without the necessity of going through intermediate speeds. An automobile type, multiple-disk clutch is operated by a lever conveniently located at the front of the headstock, and is fitted with three heavy coiled springs which separate the friction disks when the clutch is disengaged, and also apply a large cone friction brake to bring the spindle to rest immediately.

The entire range of spindle speeds is obtained by two levers. The gears are of alloy steel, properly heat treated and hardened, and are mounted on short high-carbon steel shafts, to which they are splined. The spindle is forged from high-carbon steel and mounted in tapered bronze boxes, lined with babbitt and adjustable. The end thrust is taken by ball thrust bearings. Flood lubrication is used in the headstock.

The feed gearing is located in a box attached to the frame below the headstock, and is driven directly from the spindle through a heavy roller chain. The chain tension is adjustable and a cast-iron guard encloses the chain and sprockets.

Nine changes of feed can be obtained by the manipulation of two levers. The feeds are carefully graded and range from 0.010 to 0.123 in. per revolution of the spindle. All feeds are instantly available while the machine is running. The alloy steel gears are heat treated and hardened and are mounted upon short shafts, the sliding gear shafts being multiple splined.

The apron is constructed from a one-piece, box-section casting and all shafts are supported at both ends. It is accurately tongued to the carriage and fastened by bolts and dowels. A single, positive, jaw feed-clutch is provided and controls both longitudinal and transverse feeds. All apron gears are drop forged, and the rack pinion is heat-treated and hardened.

The bed is exceptionally deep and is strongly braced. The front shear is of the improved, compensating, V-type, intended to present a thrust bearing at right angles to the tool thrust. The back of the carriage travels on a wide, flat surface and is held down by a flat gib.

The maximum swing over the shears is 18¼ in., and 12¾ in. over the carriage. With a 6-ft. bed the lathe provides a distance of 33 in. between centers. The usual regular equipment is provided, and special equipment including a quick-acting lever tailstock, a turret tool post, and other appliances can be furnished.

If a constant-speed belted motor drive is desired, a 5-hp. motor, running at 1,200 r.p.m., is located in the base of the head end cabinet leg. The motor drives the single pulley through an endless leather belt, and the entire drive is enclosed by a pressed steel guard.

Watson-Stillman Hydraulic Flanging Press

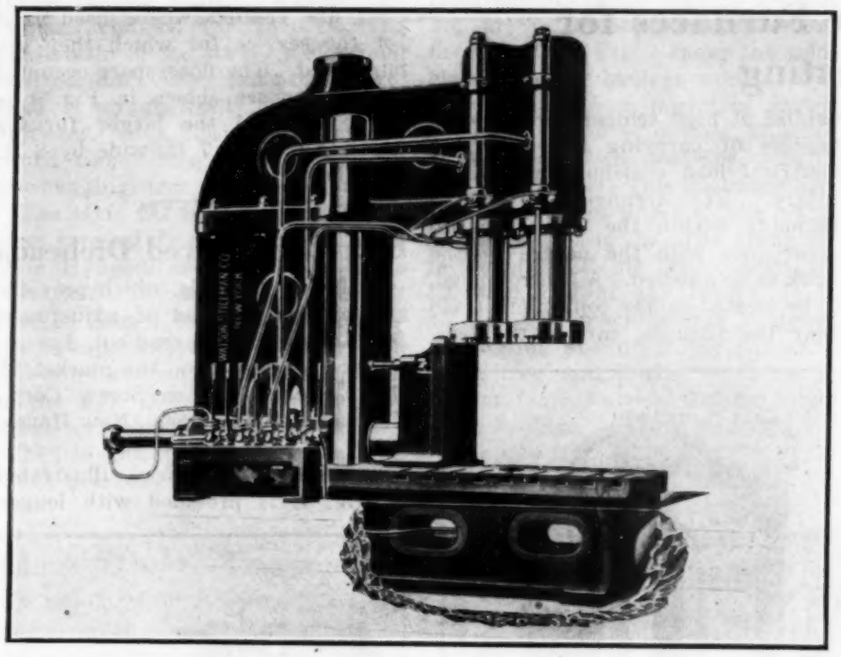
The hydraulic flanging press shown in the accompanying illustration has recently been placed on the market by the Watson-Stillman Co., 50 Church St., New York, N. Y. The machine is adapted to the flanging of plates, and is of the built-up type, the main frame being made of sections securely bolted together.

This construction is said to have advantages over the usual single-casting frame, among which are included lightness of section due to the casting being subjected to compressive stresses only, and reduction of the spring of the frame, since the tension strains are taken by two heavy columns or bolts. These columns hold the two parts of the frame securely together, and take most of the vertical ram thrust.

Another feature of the built-up construction is the possibility of renewing one section of the machine, should that part require replacement. This applies especially to the section which contains the main cylinders.

The draw-back cylinders for the return stroke of the ram are located below the top of the frame, an arrangement which reduces the over-all height of the machine and makes it available in restricted quarters. This construction also permits the mounting of a swing crane on top of the press, if desired.

The press is usually fitted with two vertical upper rams, one vertical



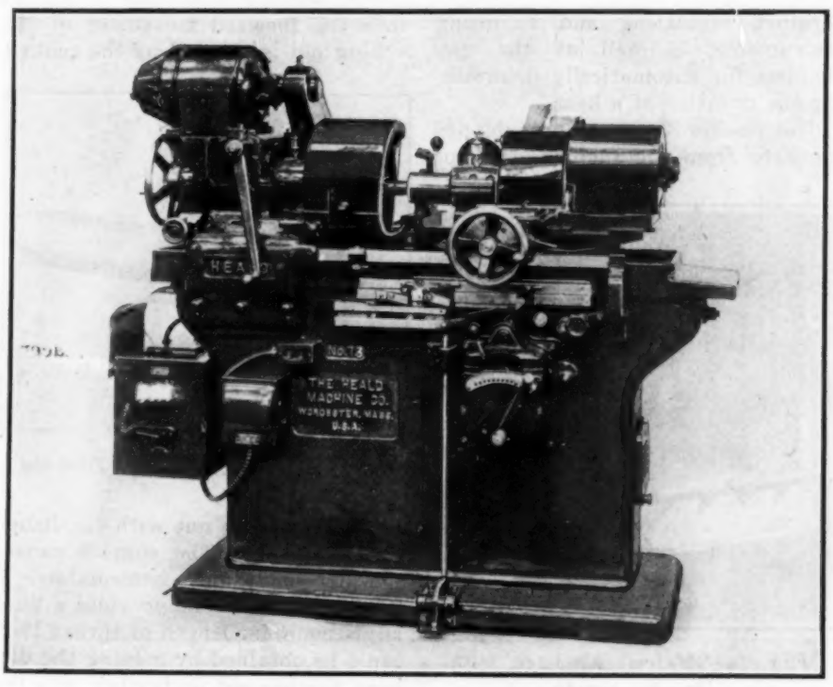
Watson-Stillman Hydraulic Flanging Press

lower ram, and one horizontal ram. The main cylinders are connected through special filling valves to the main pressure line, thereby increasing the speed of the rams and at the same time reducing the water consumption.

The machine is built in four sizes with total pressures on the vertical cylinders of 150, 200 and 300 tons.

Heald No. 73 Motor-Driven Grinding Machine

The Heald Machine Co., Worcester, Mass., has recently placed on the market a No. 73 motor-driven grinding machine, which follows the general design of the No. 72 hydraulically-operated machine, except for the drive. The No. 72 machine was previously described on page 311, Vol. 58, of the *American Machinist*.



Heald No. 73 Motor-Driven Grinding Machine

It is said that the three small motors, by which the No. 73 machine is driven, permit better control and ease of operation than would be possible with one large motor. The three motors consist of a ¾-hp., variable-speed, d.c. motor for the work head; a 3-hp., constant-speed motor for the wheel head; and a 1½-hp., constant-speed motor driving the rear shaft and furnishing power for the hydraulic table traverse.

The work head is driven through a silent chain by its independent ¾-hp., d.c. motor, and a motor-generator will be furnished to supply current for this motor if direct current is not available. This apparatus is so arranged that the whole machine will still be a self-contained unit. This motor is connected to the master switch at the front of the machine and its speed is controlled through a rheostat. It can be stopped by the master switch or by the rheostat, but need not be stopped in order to stop the work head, a friction clutch being provided for this purpose. The clutch lever is conveniently located and, when the proper work speed has been adjusted, it is unnecessary to disturb the motor control.

The constant-speed motor for driving the wheel head should preferably be of the a.c. type. An endless belt is used between motor and wheel head, and a belt tightener is furnished. The wheel speed is always correct and it is not necessary to figure speeds. A simple push-button control is provided to start and stop the motor, and a 5-hp. motor can be furnished for heavy production work. The method of driving the wheel by an independent motor insures constant speed under any load.

The third motor drives the rear shaft through a silent chain, and an a.c. motor is preferably used. This motor starts and stops with the wheel-head motor and is controlled by the same push button. Both of these motors are protected by temperature relays, which can be reset at the rear of the control box.

This arrangement of three independent motors does away with all intermediate drives, change gears, shafts, speed change boxes, etc. It is claimed that a total of 5¼ hp. does about as much work as would be accomplished by a 10-hp. single motor. A practically unlimited range of speeds for the work head is also provided by the independent d.c. motor.

"Metco" Electric Furnaces for Heat Treating

The American Metallurgical Corp., 168 Dartmouth St., Boston, Mass., has recently developed a line of furnaces of the box type, intended to cover the general field of heat treating and carburizing. Fig. 1 shows the smaller size with an effective hearth area 12x24 in., and in Fig 2 is shown the construction of the larger sizes,

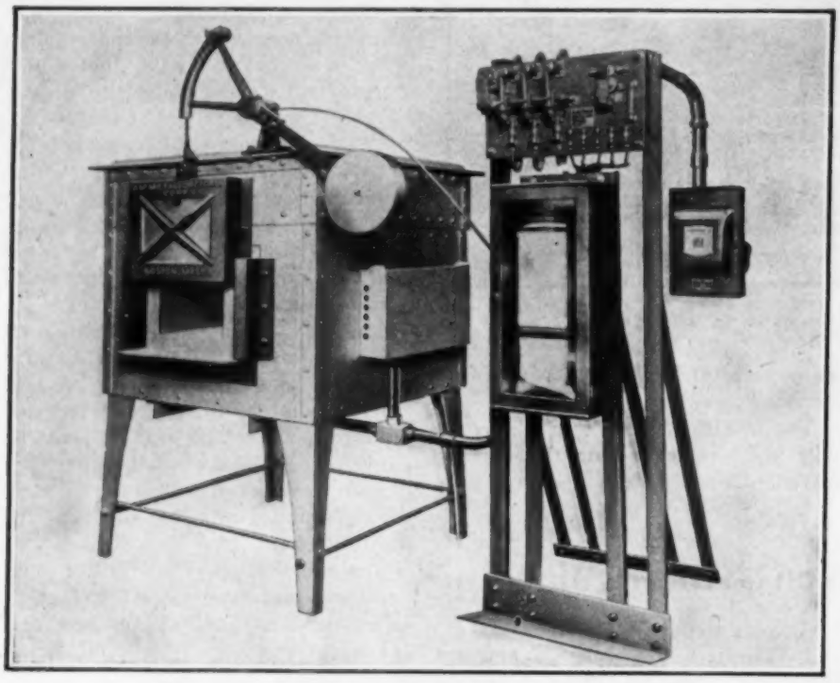


Fig. 1—"Metco" Furnace with 12x24-in. hearth

which can be furnished with hearth areas 24x45 in., 3x5 ft., 4x6 ft. and 4x8 ft., respectively. The electric capacity of the small furnace is 15 kw., and for the next two larger sizes 30 and 70 kw. respectively. For the sizes with hearth areas above 3x5 ft., the electrical equipment is proportioned to suit the particular class of work for which the furnace is to be used.

In the larger sizes the framework is of structural steel shapes supporting a shell of steel plates, the space between the shell and the heating chamber being packed with a suitable insulating material. The vertically sliding doors are balanced by suitable counterweights to insure ease of movement. The hearth is constructed of Crystolon or Carborundum tiles intended to withstand indefinitely the abrasion of dragging or pushing work over it.

The heating elements are of Chromel "A" alloy, which does not oxidize at high temperatures and is capable of carrying the maximum electrical load continuously without injury. The arrangement of the elements within the furnace is in accordance with the nature of the work to be handled. A control panel, to be located in any convenient place near the furnace, carries the temperature regulating and recording instruments as well as the mechanism for automatically determining the duration of a heat.

The smaller furnaces are shipped complete from the factory. Larger sizes are erected where used, and for the service for which they are purchased. The floor space occupied by the furnace shown in Fig. 1 is 36x40 in., and the larger furnace requires a space 7 ft. wide by 8 ft. 6 in. long.

Fig. 2—"Metco" Furnace with 3x5-ft. hearth

H & G Improved Dieheads

A line of dieheads, which provides an improved method of adjustment for the length of thread cut, has recently been placed on the market by the Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven, Conn.

The style CC diehead, illustrated in Fig. 1, is provided with longer guide pins than the style C head, used on hand turret machines, and the locking pin with its threaded shank is provided with an adjusting nut and locknut. When the forward movement of the turret or tool holder ceases, the die continues to thread until the forward movement of the locking pin is stopped by the contact of the adjusting nut with the flange on the shank. The contact causes the diehead to open immediately.

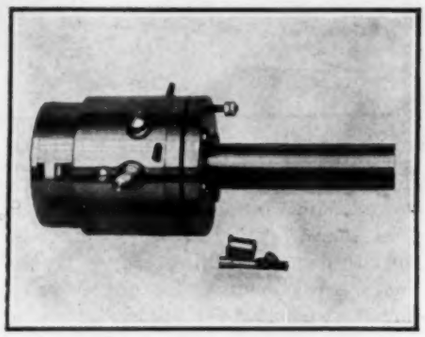


Fig. 1—H & G Style CC Diehead

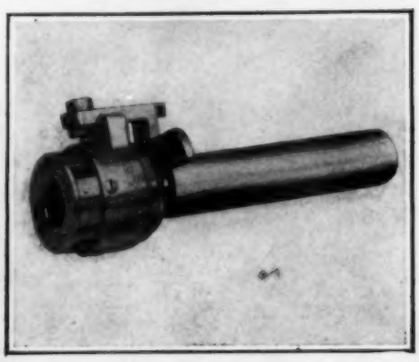


Fig. 2—H & G Style D Diehead

This arrangement provides a finer adjustment for length of thread than could be obtained by moving the diehead further out or further into the

turret or tool holder. Another advantage claimed for this tripping mechanism is the simple and strong construction. The closing of the diehead is automatically accomplished by means of a closing stud or lug which comes into contact with an overhanging arm on the machine.

The style CC head is available in sizes ranging from ⅜ to 3 in. The style D head, shown in Fig. 2, is furnished in sizes for cutting threads from ¼ to ⅝ in. in diameter and is especially adapted for use on Cleveland automatic screw machines. In the style D head the fine adjustment for length of thread is contained in the arm from the shank, which overhangs the head.

Clark "Duat" Tructractor

A small, gasoline-motored, haulage vehicle with a crane attachment is now being marketed by the Clark Tructractor Co., Buchanan, Mich. The machine is known as the "Duat" Tructractor and is shown, with and without the crane attachment in place, in the accompanying illustrations.

The superstructure is carried on three wheels and the machine will pivot on one wheel, turning in a radius of only 52 in. This allows it to turn around in a box car and provides exceptional service ability in constricted spaces. It is claimed that the "Duat" Tructractor will tow a load of from seven to ten tons, or from one to twenty trailers, depending on the condition of the factory floor or yard. Fig. 1 shows the vehicle as used for haulage work.

By means of an ingenious device, a one-ton crane is quickly attached to the front of the machine, without the use of tools. This appliance converts the tractor into a mobile crane, as shown in Fig. 2. The crane attachment will lift and carry its 2,000-lb. load at any height up to 56 in. The machine was designed for loading and unloading box cars, the lifting and towing of loads in narrow factory aisles, and for interplant haulage.

The two traction wheels are 16 in. in diameter and are fitted with 3½-in. solid rubber tires. The length of wheelbase is 40 in. and the tread is 33 inches.

Lindmark Tool Holder

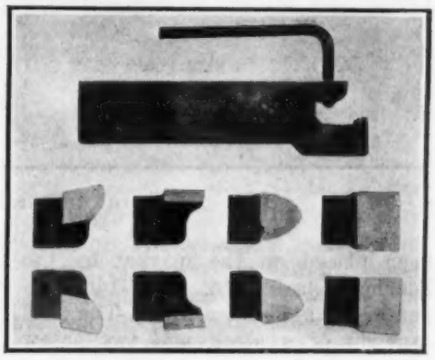
The Haffling Tool & Manufacturing Co., Bridgeport, Conn. is now marketing the Lindmark tool holder, for use on lathes, boring mills and planers.

As shown in the accompanying illustration, the holder consists of a special shank with a recess in which the tool bits are clamped. The tool bits are shaped to fit the recess in the shank, and a headless setscrew in a projection of the shank clamps the bit in position.

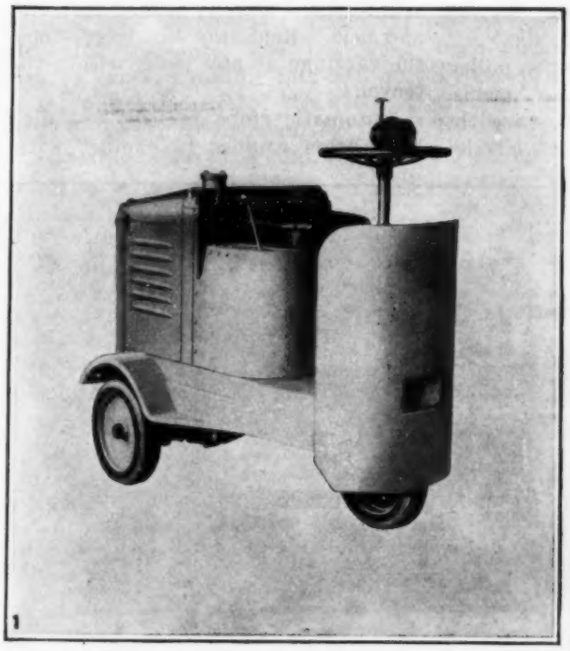
Tool bits or cutters of high-speed steel or stellite are furnished with the shank, and with various shapes of cutting edge to suit the work to be done. The chamfer at the rear end of the cutter is arranged to fit the wedge surface in the recess, so that the clamping of the cutter causes it to be positioned by the shoulder at the end of the shank. To avoid slipping of the tool bit under the setscrew, two or three depressions are spotted in each bit to receive the point of the screw.

Adjustment of the cutter in the shank may be made by moving the cutter transversely and clamping it in the desired position. When it is necessary to grind the tool, it can always be replaced in the exact position that it formerly occupied without unclamping or changing the adjustment of the shank.

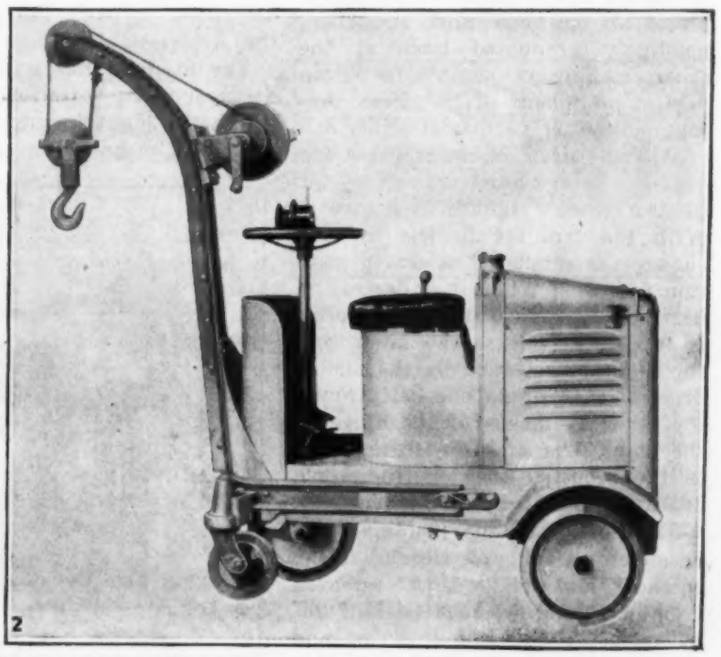
A variety of shanks can be furnished, including straight, gooseneck, and right- or left-hand offset shapes.



Lindmark Tool Holder



1

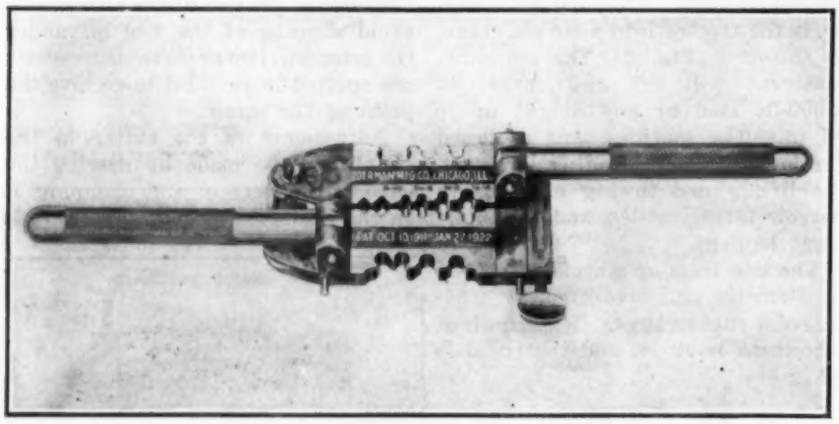


2

Fig. 1—Clark "Duat" Tructractor. Fig. 2—"Duat" with crane attachment

Zoerman Adjustable Screw Plate

An adjustable screw plate designed so that several threads can be cut with one pair of dies has recently been placed on the market by the Zoerman-Clark Mfg. Co., 7146 Carpenter St., Chicago, Ill. The tool consists of a stock and two screw plates, as shown in the illustration. Several dies are made in each screw plate, so that with the two screw plates which are included in one tool, a number of different threads can be cut. With the tool shown, threads from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. can be cut, and the square openings make it possible to use the tool as a tap wrench, if desired.



Zoerman Adjustable Screw Plate

The stock is made in two sections, connected by a graduated aligning hinge at one end and a correspondingly graduated latch at the other, making it possible to obtain perfect alignment of the dies. Adjustment of the vernier at either end of the die-stock allows for cutting over- or under-sized stock, or for cutting either a tight or loose thread. With the tool set in the position shown, the smaller dies are in position for use. When it is desired to use the larger dies, the thumb screw is turned to release the latch, and the dies are reversed by the simple process of swinging one half around the other by means of the hinge at the end. The dies are then locked in the required position, the whole operation taking but a few seconds.

The design of the tool makes it possible to cut threads close up to the shoulder, and the die can be removed from a thread without backing off by releasing the thumb screw and opening the die. The tool is easy to clean and there are no extra parts to be misplaced or accidentally lost.

All die stock parts are made of good quality steel, case hardened throughout. The dies are made from a fine quality of tool steel, carefully hardened and tempered. The handles are hinged so that the tool can be folded to occupy a space $9\frac{1}{2}$ in. long. The weight is $3\frac{1}{2}$ pounds.

Landis 20-In. Pipe Threading and Cutting Machine

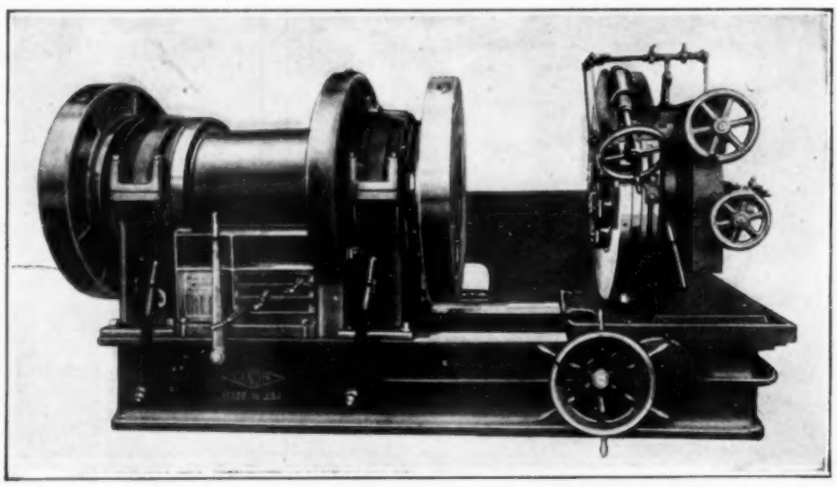
The Landis Machine Co., Waynesboro, Pa., has recently added to its line of pipe threading and cutting machines a 20-in. size. The range of this machine is from 10 in. to 20 in., and the entire range is covered by one diehead and one set of chasers. The general design of the machine is similar to the 18-in. size described on page 192, Vol. 59, of the *American Machinist*.

The machine has a single pulley drive and the variations in speeds, which are eight in number, are obtained by means of a speed box located beneath the main spindle. A friction clutch is mounted on the main drive shaft with the pulley or, if the machine is driven by an electric motor, a chain sprocket will be substituted for the pulley. The operating cone of the clutch is moved by two levers which are located at the ends of the head stock within easy reach of the operator. The forward lever is used for starting and stopping when making up flanges, and the lever in the middle is for reversing.

All gears are fully enclosed and, with the exception of the main driving gear and its pinion, they run in an oil bath. The main bearings of the hollow spindle are lubricated with flat link chains which run in oil, contained in large reservoirs in the base. The driving pinion shaft, as well as the reverse shafts, are lubricated by sight feed oilers. At each end of the hollow spindle there is a three-jawed independent chuck for holding the pipe. The rear chuck is also equipped with flange grips for fitting flanges.

The carriage which supports the die head, the cutting off tool, and the reaming tool, is moved either by power or by hand. The power traverse movement is both forward and backward and is controlled by a lever located on the operating side of the carriage. In advancing the carriage toward the chuck, the lever is pulled and held until the threading position for the die is reached. In reversing the movement of the carriage, the lever is pushed forward and held. Releasing the lever stops the carriage at any point within its travel.

Automatic stops prevent the diehead from coming in contact with



Landis 20-In. Pipe Threading and Cutting Machine

the chuck in the forward movement, and keeps the carriage from running off the guides of the machine in the backward movement. The reaming tool is quickly set to position and locked with a lever.

The machine is converted for motor drive by replacing the pulley with a sprocket and mounting the motor on a base over the gear box. A silent chain is employed to drive from the motor to the sprocket. The machine employs the Landis long life tangential chaser.

The length of the machine is 12 ft. 2 in., and the height is 6 ft. The extreme width of the belt-driven machine over the belt pulley is 5 ft. 10 in., while the extreme width of the motor driven machine over the motor plate is 6 ft. 8 in. The weight of the machine is 22,000 pounds.

Federal Dial Comparator

A large sized dial measuring instrument now being marketed by the Federal Products Corp., 15 Elbow St., Providence, R. I., is shown in the accompanying illustration.

The dial is graduated to read in ten-thousandths of an inch, plus or minus, and the range covered by the measuring jaws is $\frac{1}{4}$ of an inch. The measuring spindle may be raised and held in any desired position by loosening the knurled thumb screw on the top of the indicator and turning the collar.

The instrument is designed to be used as a comparator for the inspection of small pieces. It is set to the nominal size of the piece, minus the allowable tolerance, and the work may be handled rapidly into and out of the gage, because of the bevelled outer corner of the measuring jaws.

An adjustable back-stop pin enables the operator to bring the full diameter of the piece between the jaws quickly and with certainty. The gage is attached to its support through a swivel joint, allowing it to be tilted to any angle that may serve the convenience of the operator.

Federal Dial Comparator

Stevens "Spintite" Socket Wrench

A line of small socket wrenches, which have been designated "Spintite," has recently been placed on the market by Stevens & Co., 375 Broadway, New York, N. Y.

These wrenches are furnished in three sizes to fit $\frac{1}{4}$-, $\frac{5}{16}$-, and $\frac{3}{8}$-in. hex nuts. The stems are hollow so that a nut can be tightened on a projecting screw and the tools have screwdriver handles.

Stevens "Spintite" Wrench

The wrenches are especially adapted for assembly work on electrical or other devices, as well as for general use in homes and garages.

"Quixsum" Adding Machine

A fractional adding machine of exceptional simplicity has recently been placed on the market by the Precision Adding Machine Co., Gotham Bank Bldg., New York, N. Y. The device is known as the "Quixsum" adding machine and is shown in the accompanying illustration.

The machine shown will add dimensions given in feet, inches, and fractions of an inch. Four dials are provided, the one at the right for adding fractions of an inch in thirty-seconds, and the others for inches, feet, and hundreds of feet, respectively.

To operate the dial, the point of the stylus is inserted in the hole opposite the number to be added, and the dial is turned clockwise until the stylus strikes the stop. After all numbers and fractions have been added on the proper dials, the answer can be read directly through the small slots at the left of the dials.

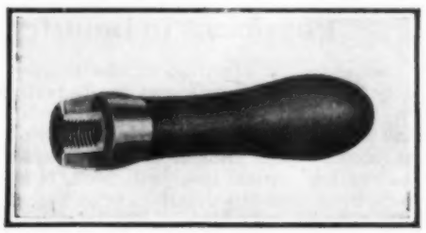
"Quixsum" Adding Machine

The machine may be cleared by turning each dial to its zero position by the stylus, or the clearing knob may be used. When this knob is depressed, each dial may be turned, by means of the knurled knob at its center, in a clockwise direction until it stops.

The device is 15x4½x1 in. in size and weighs but 3½ lb., so it is easily portable. The materials used are selected for the service and the parts are carefully made, so that the apparatus will be durable and accurate. It is said that only one-eighth of the usual time is required for the type of addition mentioned.

Skroo-Zon Improved File Handle

An improved design of the "Skroo-Zon" file handle, formerly manufactured by the Thurston-Bernay Co., San Françisco, Calif., and described on page 529, Vol. 52 of the *American Machinist*, is now being marketed by the Safety Tool Corp., 124 E. Moulton St., Watertown, N. Y.



Skroo-Zon Improved File Handle

In the former model the threaded die was in two parts and, as shown in the accompanying illustration, the present handle incorporates a one-piece die. This eliminates any tendency for the file to wabble in the handle and provides a firm grip. The handles are furnished in a range of eight sizes, the largest being suitable for soldering irons and scrapers, as well as files.

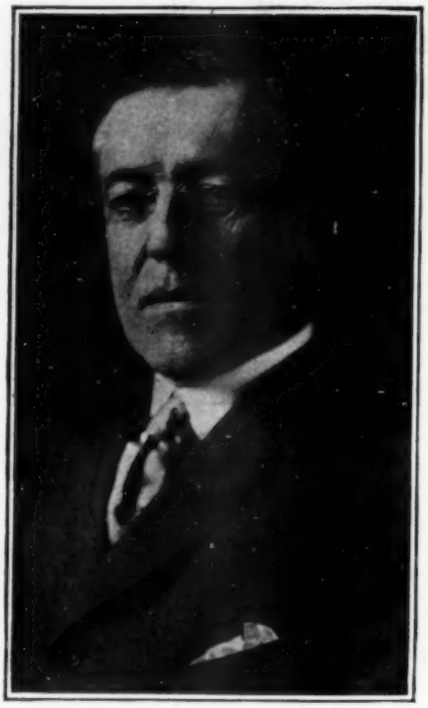
News of the Week

Woodrow Wilson
1856–1924

For the second time within a year the tremendous pressure put upon its chief executive by the United States of America has claimed a victim. Warren G. Harding died in harness after a breakdown strikingly similar to the one suffered by Woodrow Wilson four years earlier. Mr. Wilson managed to recover from the first attack but he never regained health and strength and died, another martyr to the demands of official service.

The daily press has carried such comprehensive accounts of Woodrow Wilson's life and work that it is unnecessary to go into detail here. It is sufficient to say that his career as President of Princeton University, Governor of New Jersey and President of the United States showed him to be a hard fighter, extremely individualistic but moved by the highest ideals. Had he been able to subordinate his individualism to a spirit of co-operation it is probable that he would have been much more successful at Versailles and that the great fight he made for the League of Nations when he returned would have been unnecessary. As it was his idealism found little support from the astute politicians with whom he fenced for a lasting peace agreement and he found himself unable to prevail alone.

It is too soon after his death even to estimate the position history will accord him. His many admirers and friends are desolated. Even his most vigorous opponents admit his high purpose. The nation for which he gave his best mourns his loss and looks hopefully to the future for the fulfillment of his dreams.



Resolution on Death of Lawrence B Sperry

The following resolution of affection and respect to the memory of Lawrence B. Sperry, has been adopted by the board of governors of the Aeronautical Chamber of Commerce of America, of which board Mr. Sperry was a member:

"Resolved: That we, the officers and governors of the Aeronautical Chamber of Commerce of America, on behalf of the members of said organization and as representatives of the aeronautical industry, desire to express to the family and friends of Lawrence B. Sperry our deep sympathy and bereavement over the loss of our friend, associate and counsellor.

"The art and science of aviation, representing as it does, the mechanical mastery by man over the most difficult and stubborn forces of nature, is requiring for its ultimate achievement sacrifices that are indeed hard to bear—none more so, however, than the loss of Lawrence Sperry, with all his name leaves as a stimulating example of the highest order of progress, skill, integrity and enthusiasm.

"The world has lost another great genius and pioneer in aviation whose sacrifice, however, strongly fixes the determination of his associates in aviation and particularly those who had the advantage of being associated with him on this board to achieve mastery of the elements that have caused so great a loss."

Physicians in Industry Advise on Use of Iodine

At a recent meeting of the Conference Board of Physicians in Industry in New York, some valuable hints on the use of iodine in industrial and other accidents were embodied in a recommendation which has just been made public by the physicians' organization. The board of physicians has been organized to improve conditions surrounding employment, and to safeguard employees in the industrial establishments of the country against the danger of accident, infection, and other preventable disabilities.

Noted medical men attending the sessions reported that the misuse of iodine often leads to unsatisfactory results. They have daily seen in their work as supervisors of the dispensaries in some of the nation's largest factories the results of mistakes in using iodine in cases of injury, and these conditions also exist in many homes.

"Tincture of iodine," says the statement of the physicians, "should be used only in and around the wound. It should be applied within eight hours after the injury occurs.

"Every skin, no matter how clean it may appear, has thousands of germs on its surface ready to poison a fresh wound before Nature can build a defense against them. If iodine is applied immediately, or a short time following the injury, these germs are destroyed before they have a chance to infect the wound. If application of iodine is delayed beyond eight hours the germs will have grown into the wound so deeply that the iodine will not reach them.

"One thorough application of iodine is enough as it has no healing properties. It should not be applied too strong, as sometimes occurs when the solution has been made stronger by leaving the cork out of the bottle and allowing the contents to evaporate.

"Apply folds of gauze (bandage, not cotton) directly to the wound. Never soak the gauze in iodine as this will burn the skin. Never use tincture of iodine on unbroken skin surfaces as it frequently irritates and often blisters, producing in turn a wound that later may become poisoned."

Pierce-Arrow Did Not Buy Curtiss Plant

The Pierce-Arrow Motor Car Co., Buffalo, will not take over the old Curtiss plant in that city as was erroneously stated in the Jan. 17 issue of the *American Machinist*. The Curtiss plant was purchased from the government by the Pierce plant of the American Radiator Co. which is in no way connected with the Pierce-Arrow Motor Car Co.

New Railroad for Florida

A new railroad to be known as the Florida, Western & Norfolk, is being financed by lumber and real estate interests in Florida, it was reported in the New York financial district. The report came simultaneously with news from Washington that application had been made before the Interstate Commerce Commission for the construction of such a road, 205 miles in length.

According to the plans made public yesterday the main line will extend from Coleman to West Palm Beach, Fla. There are to be two branches.

Plant Visitation Features A.S.S.T. Meeting Held at Rochester

Half of the two-day session devoted to technical papers

A solid day, from 9 o'clock until 5:30, was devoted to visiting four of the largest industrial plans in Rochester by the members of the American Society for Steel Treating at the winter sectional meeting held last week.

At the Gleason Works the members gave special attention to the heat treating room where they saw an electric furnace for the heat treatment of high-speed steel which is automatic in its operation except for the loading of the tools on the charging elevator. There are other special furnaces in the same room and other apparatus of almost equal interest. The heat treating department was a good example of a spic-and-span room with clear atmosphere, a rather unusual combination in connection with the processes of hardening, annealing and tempering.

At the plant of the Taylor Instrument Co. the visitors were shown how thermometers and other heat-measuring instruments are made. Operations in the manufacture of general pyrometric equipment were shown.

Luncheon was served by the Bausch & Lomb Optical Co., after which the steel treaters were taken through the glass-making plant and various departments devoted to the manufacture and assembly of scientific instruments.

The day's trip was concluded by a visit to the main plant of the Eastman Kodak Co., where the research laboratory was of especial interest.

Excellent Papers Presented

An outstanding paper, delivered during the technical session, was that by A. H. d'Arcambal, chief metallurgist of the Pratt & Whitney Co., "Some Carbon and High Speed Steels Used in the Manufacture of Small Tools." Prof. H. M. Boylston, Department of Metallurgy, Case School of Applied Science, Cleveland, gave an illustrated talk, "Control of Production by Scientific Methods." He threw on the screen illustrations showing the development of apparatus and methods for heat control from the most primitive to present day instruments.

Dr. Ancel St. John, of the Research Laboratory, Union Carbon & Carbide Co., Long Island City, read a paper, "Recent Developments in X-ray Crystal Analysis." J. V. Emmons, chief metallurgist of the Cleveland Twist Drill Co., Cleveland, Ohio, explained the underlying principles upon which the annealing of tool steel is based. E. K. Kimball, Jr., and G. R. Brophy, both of the research laboratory of the General Electric Co., Schenectady, gave a joint paper on the photo elastic method of analysis with particular reference to railroad pinnion gears. Mr. Brophy spoke more especially on the heat treatment basis.

There was held an informal dinner in co-operation with the Rochester Chamber of Commerce at which Dr. Rush Rhees, president of the Universiay of Rochester, presided. R. M. Hudson of the Department of Commerce, Washington, gave a talk on simplification.

The sectional meeting as a whole was carried out with the enthusiasm that characterizes the society. The steel treaters are on their toes and are making big strides in the important phase of industry to which they are devoted.

Plans Perfected for A.S.S.T. Convention

The sixth convention and International Steel Exposition of the A.S.S.T. will be held in Boston the week of Sept. 22 to 26 inclusive. This decision was reached at the meeting of the board of directors in Washington, Nov. 2, but definite announcement has been withheld due to the fact that some difficulty was experienced in Boston in securing a place with adequate facilities for holding the exposition.

Through the courtesy of Gov. Channing H. Cox and Chairman William F. Williams, of the Division of Highways and Waterways, permission has been granted the society to use the Commonwealth Pier for the exposition. This pier is ideally located and has wonderful facilities for expositions. All of the spaces will be on one floor, as can be judged from the dimensions of the pier, which are 120x1,200 ft. Floor plans have been drawn up and forwarded to the exhibitors who were present last year in Pittsburgh, and will soon be given a general distribution. The complete co-operation of the State of Massachusetts, together with that of the Chamber of Commerce of Boston, assures everyone that the convention and exposition this year will be the greatest gathering of iron and steel men that has ever been witnessed in New England.

The program committee, under the direction of L. D. Hawkridge, held a meeting in New York in December and laid plans for the convention papers and it is confidently expected that the papers will be of such caliber that the meeting will be more than comparable with the wonderful technical sessions held in Pittsburgh.

The New England chapters have all pledged their hearty support to Mr. Handy, chairman of the Boston chapter, to assist in making the 1924 convention not only of great local interest, but of interest to all the New England states.

Car Loadings Set New High Record

Loadings of revenue freight for the week which ended Jan. 19 totaled 895,276 cars, the largest number of cars ever loaded in any one week in any January on record. Compared with the corresponding week of last year, which was the highest mark ever reached for a simliar week, the loadings advanced 30,979 cars. There was also an increase of 23,011 cars over the previous week this year.

Other indications of the volume of loadings for this time of the year are the fact that the total loadings were 164,167 greater than the same week in 1922, and 186,618 cars more than in the same week of 1921. The loadings were even 90,410 cars greater than in the period of heavy business in 1920.

Nash Buys Mitchell Plant

Sale of the defunct Mitchell Motors Co. plant, Racine, Wis., was made to the Nash Motors Co. of Kenosha, Wis. The price paid was $403,000. Machinery of the plant was sold at a previous sale. The plant covers 36 acres, and it was valued in 1922 at $1,750,000.

Heated bidding marked the sale between representatives of the Nash company and the Hupmobile Motors Co. of Detroit, Mich., commencing at $200,000. The high Hupp bid was $400,000, eclipsed only by the Nash offer. Nash officials announced their intentions of building the "Nash Six" in the Racine plant.

Charles D. Hastings, president of the Hupp company, was present at the sale, as were representatives of banks in New York, Chicago and Milwaukee, creditors of the bankrupt Mitchell Motors Co.

December Exports of Machinery

Exports of metal-working machinery during December, 1923. with revised comparative figures for December, 1922, as compiled from the returns to the Department of Commerce, were as follows:

	1922 Value	1923 Value
Lathes	$106,818	$82,535
Boring and drilling machines	82,266	56,771
Planers, shapers and slotters	28,169	3,962
Bending and power presses	20,146	25,970
Gear cutters	9,838	33,336
Milling machines	32,095	33,897
Thread cutting and screw machines	29,977	62,725
Punching and shearing machines	8,534	9,061
Chucks; centering, lathe, drill and other	24,276	25,389
Reamers, cutters, drills and other parts for machine tools	77,357	142,013
Pneumatic portable tools	62,624	73,467
Foundry and molding machinery	27,317	24,641
Other metal-working machinery and parts of	739,352	318,792
Total metal-working machinery	1,362,594	953,011

S.A.E. Members Hear Interesting Papers on Production Methods

Various phases of work discussed by able speakers

In discussing crankshaft production problems, at the S.A.E. meeting held in Detroit, T. M. Carpenter of the Saginaw Crankshaft Co. outlined the methods used in making crankshafts for the motor builders. The general method is to first rough turn and rough grind the center bearing so as to equalize the variations in the forging between the two ends.

Three wide tools are used in rough turning and tests show that over 3 cu.in. of metal is removed per minute. The rough grinding leaves 0.025 in. for finish on the diameter while the end limits are 0.01 in. Shafts are then drilled for oil holes with hand-feed drills, these being found more economical when all things are considered. The holes are burred, blown out and the crankshaft inspected and given a static balance.

The tolerance for final grinding on the pins and line bearings is 0.001 in. for diameter variation and 0.0025 in. for taper and out of round. The tolerance on angularity is 0.010 to 0.015 in. in the 120 deg. throw of a 6-cylinder shaft. The bearings are hand buffed and then the shaft receives a dynamic balance on a Norton machine.

Glenn Muffly pointed out that if a shaft is to be balanced dynamically, it is not only a waste of time to balance it statically, but that this operation may actually increase the work of balancing it dynamically. This, of course, depends on where the weight is removed in the static balancing.

Tingley Substitutes for Fordham

The paper on, "Reducing Costs by Efficient Management," was presented by E. H. Tingley in place of T. B. Fordham, owing to the latter's inability to be present. The methods explained are in use by the Delco-Light Corp. of Dayton, Ohio, the foundation being to divide management into four functions—engineering, finance, sales and production. The system was splendidly presented and brought out prolonged discussion. He laid stress on the importance of the personnel and the giving of each man a definite responsibility for results, but urged as much flexibility as possible in the handling of all work.

Under the system described production has control of both purchaser and shipments, the idea being that, as production can function without materials, that department should have control of securing them. Each foreman is given as much responsibility as possible. The employment manager, who has been a mechanic of wide experience, picks out the likely applicants, but the foreman has the final say as to his being suitable. In a similar manner, the foreman can release a man from his department, but the employment manager interviews him and may suggest him to another foreman for trial.

Inspection is under the direct control of the general manager, the chief inspector reporting directly to him.

"Hot Swaging," was a paper by R. A. DeVlieg of the Maxwell Motor Car Co. The method improves the strength of the axle about 15 per cent and saves 7 lb. of metal per car. The swaging dies revolve 225 r.p.m. and there are 12 rollers in the cage. The number of blows is regulated by the speed of the cage carrying the rollers, this being controlled by a brake. The dies and rollers are kept from overheating by water, which must not touch the bar being swaged. The rollers are lubricated with grease. The bars are held in a special chuck with eccentric pins which automatically grip the axle.

The maintenance cost is higher than with machine tools, the spindle bearing wearing considerably. Dies last for 5,000 to 6,000 pieces on the first and second operation and 10,000 pieces on the third and last. The production is 60 per hr. on the first, 70 on the second and 80 on the third operation. Over 125,000 axle shafts have been swaged. There is a twist in the axles, frequently as much as those turns in its length, but this does not in any way affect its strength.

Daniel Meloche of the Holley Carburetor Co. illustrated and described a method of making iron castings in a permanent mold. The molds are of iron coated with a refractory material which is not affected by the molten iron. Sand cores are used. One man pours 400 molds per 8-hour day. Twelve of these molds are mounted on a revolving table and 2,500 molds are poured per day.

The molds are coated with lamp black by a gas flame before each pouring. There is no shrinkage and the iron is of closer grain and from 25 to 30 per cent stronger than iron cast in a sand mold. It machines readily. The average cost of the molds used was $8.66 and from 10,000 to 15,000 castings can be made from a single mold.

King Sewing Machines To Be Made by White

The King Sewing Machine Co. of Buffalo has sold its rights and some property used in the manufacture of King Sewing Machines to the White Sewing Machine Co. of Cleveland. The single-purpose equipment of the King plant used in making the sewing machines will be moved to Cleveland about April 1.

The sewing machine end of the business represents about one-third of the production of the King plant in Buffalo. The other two-thirds production is devoted to King automotive parts, King cream separators and King radio parts and equipment.

For some time past the King company has been making master cylinders, supply tanks and all fittings for Lockheed hydraulic four-wheel brakes used on Peerless, Moon, Dort, Jordan, Wills-St. Clair. Maxwell, Chalmers, Chrysler and several other makes of automobiles.

Can Order Be Brought Out of Chaos?

Marcus in the New York Times

China Now Buying Its Machinery from United States and England

Germany has lost its hold on much coveted trade

Examination of the Chinese Maritime Customs returns shows an astonishing increase in the total value of machinery absorbed by China, says W. H. Rastall, chief of the Industrial Machinery Division of the Department of Commerce, in the current issue of Commerce Reports. The volume in 1922 was the greatest ever taken. In both 1921 and 1922 China imported about fifteen times as much machinery as in 1915.

The participation of the different nations in this trade is shown in the department's chart, which is presented both on a basis showing the volume of the trade from each supplying country in dollars, and also in percentage. The participation of Japan in this trade is interesting as showing a business that was of negligible proportions up to, say, 1915, but since that time has shown a surprisingly consistent increase in volume. This trade when expressed in percentages conveys a very different impression and shows clearly the effect of war influences, but altogether it is doubtful as to whether the word competition is appropriate in this connection because the character of machinery produced in Japan and marketed in China is ordinarily very different from that produced in such countries as the United States.

Germany's Loss

The position of Germany is also very interesting. It will be remembered that articles have frequently appeared in the press stressing the importance of the German position in this trade, the cleverness of the sales methods adopted by German distributors, the peculiar advantages the machinery trade of Germany enjoyed in China because of the support it received from diplomatic and banking interests, and much other comment of a similar nature, and it is clear that at least on a percentage basis the statistics show that Germany occupied an important position in this trade prior to 1914. During the war the trade was negligible, but immediately following the armistice it began to pick up and greatly increased, at least through 1922, but even at its best, in spite of the advantage of the depreciating mark and various official efforts to stimulate this business, in spite of banking and diplomatic support and the advantages of organization as in cartels, this trade has not assumed really significant proportions since the war, and the latest reports from China indicate that German competition is losing its potency there. It would appear that American manufacturers will not find the German influence in this market a matter of serious consequence before the political situation of Europe is clarified.

In view of all this, it would appear that the serious competition for the machinery trade of China lies very largely between American and British suppliers. Under war influences, however, American participation in this trade increased rapidly, the volume of our exports to China being multiplied a great many times, and this expansion as expressed in dollars continued through 1921, though as expressed in percentage the participation of the United States (and Canada) decreased as from 1920. In the year 1921 the share of this business secured by British manufacturers was almost exactly equal to that supplied by American producers, each securing almost exactly 40 per cent of the business, but it will be noted that in 1922 the American participation in this trade shrunk seriously to about 23 per cent, while the British expanded their participation to about 44 per cent.

It is true that the entire situation cannot be expressed with a simple diagram and a few crooked lines on a chart, for in China the machinery trade is largely influenced by railway, mining, and other enterprises held by concessionaires who are required, in at least some instances, to purchase their engineering materials from the countries that originally furnished the capital on which these enterprises were developed. In such markets as Japan, where greater freedom exists, the British participation has not been so important. A large number of other factors might be introduced in this discussion, but the fact remains that American manufacturers should give thoughtful attention to the position they are coming to occupy in all foreign markets.

News of Washington Activities

By Paul W. Wooton

A bill to prevent fraud and improper practice in business before the United States Patent Office was introduced in the House Jan. 19 by Representative L. C. Crampton of Michigan. It would provide penalties for persons professing to be patent attorneys or organizations professing to render assistance at the Patent Office if not registered and permitted to practice in that governmental agency.

"In Washington and a number of other places throughout the country, individuals, firms, and even corporations are acting as patent attorneys and inducing clients to intrust important patent business to them with the idea that they are registered to practice," said Representative Crampton in explanation of his bill.

"In several instances these attorneys have been disbarred from practice and are practicing under cover. In other instances men who never have been registered are representing themselves as patent attorneys and taking fees as such."

Coal Miners' Position

A rumor is in circulation in Washington that John L. Lewis is about to present for introduction the draft of a bill providing for some type of mediation in the coal industry. No definite information is available but if the report should be correct, it is assumed that Mr. Lewis has hit upon some plan for the creation of a tribunal to which non-union labor could appeal.

It is hardly to be supposed that Mr. Lewis will recommend a coal labor board, along the lines of the railway labor board, in view of the opposition to that body which has been voiced by the American Federation of Labor and from the fact that the mine workers have been accustomed to cite it as a horrible example of what may occur when wage regulation is attempted.

Trade Associations

Murder has been committed with a brick, but that incidental use of an essential building material does not justify the discontinuance of the use of brick. This figure has been used to illustrate the policy of the Department of Justice toward trade association statistics. Despite the fact that relatively few trade associations confine the distribution of their statistics to their own membership, the Department of Justice has insisted on continuing its foray against the trade associations on the ground that the collection of these figures constitutes a violation of the anti-trust statutes, although the Department appears to recognize that the general use to which these figures are put does not constitute an activity against the public welfare. Apparently, however, the only certain relief from this situation must come through legislation, although a great clarification might follow were it possible to secure a court ruling on a clear-cut case of statistics. In most of the rulings, which have been made by the courts, statistical activities were being used as a cloak for other practices.

The Real Losers

The situation is regarded as a very serious one for all but the larger and more highly organized business enterprises. The suppression of proper trade statistics means that all businesses, not large enough to gather them for themselves cannot form weighted judgment. For them it means business chaos. Big business is handed a great advantage on a silver platter which certainly does not conform with the spirit of the anti-trust statutes on which the anti-statistical activities are based. A perusal of the debates on the Sherman and Clayton bills discloses no reference to trade associations. It is very clear that the Sherman act was not aimed at them. The legislation was prompted by a long period of tyranny on the part of combinations of capital. The trade association is collective action for improvement.

It is true that statistics restrain trade to the extent that they prevent destructive competition. When sane men know the facts they do not rush into losses which, incidentally, are visited upon the public as well as upon themselves.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Buffalo

Contradictory reports come from various machine tool representatives in the Buffalo district and yet, on the whole, the tone of the reports is optimistic and indications are that we are on the threshold of a prosperous year. The automotive industry is one that machine tool men are watching and, while there is some buying tendency, the general attitude of this industry is one of caution and expectancy. One local machine tool office reports that the January business to date has been the best in three or four years. Another reports a January much ahead of last January and others say they are going ahead fully as rapidly as last year.

To summarize the conditions existing in the Buffalo district, some manufacturers are buying machine tools rather heavily, many more are buying conservatively and a still greater number are inquiring for material for future delivery.

The principal sales reported this week include several 24 in. lathes, a number of boring mills, one or two gear cutting machines, several radial drills, quite a quantity of small lathes and considerable second hand equipment.

Chicago

Inquiries for machine tools in the Chicago district indicate that there will be increased activity in the market, but actual sales have not taken place during January as was expected. January, 1923, was the best month of that year for many dealers but January, 1924, was about on a par with the low point in 1923.

The Santa Fe Ry. is lately reported to be inquiring for about $250,000 worth of machine tools and a like amount of cranes for its shops at San Bernardino, Cal., but Chicago dealers have not received the list.

It is reported that the Northern Pacific R.R. will soon be in the market for machinery and tools for its new shop at Brainerd, Minn. The Wabash Ry. will soon purchase machinery, tools and power equipment for its new shops at Peru, Ind. Several Chicago dealers have received an inquiry for about $75,000 worth of car shop machinery, tools and equipment for a proposed car shop at St. Paul, Minn. The New York Central R.R. has purchased a 2,500-lb. steam hammer, also a radial and an upright drill. The Santa Fe Ry. has purchased a small number of tools during the week. The Boston Elevated Ry. purchased two Ryerson-Conradson lathes. The Western Electric Co. purchased a motor driven engine for its Chicago plant. The Automatic Electric Co., Chicago, has completed purchase of about $24,000 worth of machine tools including two upright drills.

Cincinnati

The latter half of January witnessed an improvement of production in the machine tool houses in Cincinnati. Manufacturers report that their business at the present time is fair with indications that orders will increase in numbers and in size during February and March. The total volume of business during January was about on a par with that of December, according to reports from a majority of the machine tool plants. Railroads have been in the market for a considerable quantity of cheap tools, but have confined their purchases largely to this class. The railroads have prepared lists of better quality tools that they are in need of and have been seeking prices on these, but thus far they have not placed any of this business. There has been a fair amount of buying by the automotive industry.

One of the brightest spots on the local industrial map is the conveying machinery business. Production in this field is going along at a rapid pace with executives expressing their confidence in the year 1924 being one of the best years in their history. One large conveying machinery company has sufficient orders booked now to keep its plant operating at capacity for the next six months. The activity of woodworking machinery concerns is also most encouraging. One of the largest Cincinnati woodworking machinery plants is running on a full time basis.

Sales of milling machines and lathes have proceeded the past two weeks at a fair rate. Inquiries have been good. Planers have been turned out by local plants in fair numbers lately.

Cleveland

Evidence of improvement in the machine tool line has begun to develop in Cleveland. This is the opinion of leading machine tool dealers based upon the orders received.

One good indication of this is cited by A. W. Henn of the National Acme Co., which specializes in automatic equipment needed especially by the automotive industry. According to Mr. Henn, substantial replacement of obsolete machines by several of the larger automobile interests has started. Much new equipment was installed by many plants at the beginning of the war or shortly thereafter. This equipment now must be replaced.

Locally a prospect for additional equipment in automobile body work may be seen in the plans for additional construction being developed by the Baker R. & L. Co., automobile body builder, following the acquisition of the plant and property of the Rubay Co., another body factor. Plants of both institutions adjoin on the west side of Cleveland. Improvements call for an expenditures of about $100,000.

Detroit

While the automobile industry in Detroit is driving ahead under full steam or nearly so, the changes which are taking place in the industry are gradually driving out some of the auxiliary concerns, who have been making parts for automobile builders. In some cases the builder has grown to such an extent that he is taking the work into his own shop. In others the automobile builder is being forces out of the running.

Some of the equipment of these parts plants will probably find its way into the machinery market. But as comparatively little of it is anywhere near new, and the quantity is not large, it is not likely to be noticed by the representatives of high production machines. With almost no exceptions these lines of machine tools are in demand and in some cases the representatives are not putting themselves in the way of orders for the reason that the machines could not be delivered within the time usually demanded.

Philadelphia

A feeling of hopefulness for an early revival of business is held by many machine tool manufacturers in Philadelphia. There has been virtually no change in the machinery situation in the last month, according to reports from manufacturers. Some of the producers have received encouraging inquiries, indicating some substantial buying.

Manufacturers of machine-driven bailing presses say their products have been selling in fair volume. Among the smaller users, the hand-power presses are in fair demand. Manufacturers of chain belts have been enjoying a fair volume of business. Many plants using this equipment have taken advantage of the industrial slackness to renew and repair equipment. Some of the mills have brought their equipment up to date by installing individual motors for each machine.

Metal lathe manufacturers say there is a renewal of demand from the building trades. The building season has been lengthened by the extremely mild winter, which has been an aid to this line of production.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance*, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

IT IS again necessary to consider politics in studying the economic outlook—but this week it is domestic politics that demand our attention, for it is undeniable that the oil lease scandal is likely to result in some realignments in Washington that may make it difficult to pass the tax reduction bill upon which the business revivalists have based their confidence.

Then, too, it is evident that the presidential campaign will be a very bitter one, that it will probably distract attention from business during the summer and that it may give a radical third party an opening of which its leaders are certain to take advantage.

For these reasons conservative merchants and financiers are disposed to go slow and this policy is reflected in reduced inventories, restricted borrowing and the continued and increasing ease of the money market. That this is the trend is indicated by the weekly statement of the New York banks as well as by the report of the Federal Reserve System published on Friday. The latter shows a reserve ratio of 81.3 per cent and a reduction of $18,000,000 in bills discounted. It also shows a decrease of $27,000,000 in the Federal Reserve notes in circulation, which probably explains the loss of $9,000,000 in gold holdings.

These figures indicate an enormous plethora of credit and the problem of finding employment for it is being partially solved by the purchase of stocks, bonds and commodities. The result has been higher prices for many securities and firm markets for most of the staples that are speculatively dealt in.

On the Stock Exchange there has been increased activity at gradually advancing prices. The market has been helped by the declaration of an extra dividend of 50 cents a share on the common stock of the U. S. Steel Corp. This was generally construed as a declaration of confidence from the supermen of finance and the effect has been decidedly tonic.

An increase of activity in the steel industry is concurrently reported, but the underlying cause of the broadening speculation is cheap money. The same statement applies to wheat, corn, cotton, sugar and coffee. They are all higher because the ease of money tempts many to borrow and buy, and leaves few under any compulsion to sell. The consequence seems likely to be a general advance in the price level.

This will for a time cause elation, for rising prices always have that effect, but they also make many readjustments necessary and are to that extent an interference with production and consumption as well as distributive trade.

For these reasons the outlook is one which suggests caution and the need of great flexibility in the business policies followed.

What's Doing in Industry

Inquiries persist while orders lag behind in the machinery and machine tool markets, although there was a noticeable increase in selling activity in all parts of the country during the last few days of January and the opening days of February. The improvement was mainly from the automotive industries with some purchasing by the railroads.

The declaration of an extra dividend by the United States Steel Corp. was a bit of news taken by most machine tool dealers as indicative of improved markets, while improvement in the finances of many of the other steel making concerns was shown by annual statements.

The sale of small tools and electrical equipment has kept up at a good rate and there is every indication that the electrical industry will prove to be a lucrative one during this year.

Building figures show a remarkable business in construction, beyond expectations in most instances, and the prospects are for still further pleasant surprises in industrial building.

Labor troubles are at a minimum, and, according to authorities, no serious strikes or disturbing influences are in the offing.

A period of active speculation at rising prices seems almost certainly in prospect. Political uncertainties at home and abroad may act as repressing influences, but they may also act the other way.

The prevailing spirit in Europe is aptly illustrated by a letter today received from a prominent English merchant, who writes: "One of my junior partners says 'Spend all you can as quick as you can.' This appears to me good advice and I am going to act on it."

If the same spirit should become prevalent in this country; if people should come to understand that the purchasing power of money is depreciating and that it is better to own property than to have large bank balances, there is no knowing where prices would go.

This is a possibility that must be kept in mind. It is not as imminent here as in Europe, but its imminence is increasing for from one end of the United States to the other the leaven of cheap money and superabundant credit is commencing to work, and the contagion of speculation spreads rapidly in a country where there are over two thousand daily newspapers that publish "full market reports."

Facing these conditions it is hardly necessary to consider in detail the secondary causes by which the price of each separate article has been affected. Wheat and corn are up because the farmers persist in holding and hoping for help from the Government.

A threatened corner or squeeze in May cotton made possible by cheap money has lifted the entire cotton market. Sugar is higher because holders being able to borrow are under no pressure to sell.

But the higher prices at which the raw materials of industry are quoted have not yet been reflected in the market for the finished products. Cotton goods are no higher and the demand is still slack. Although there has been a substantial advance in raw wool during the last month or two, the American Woolen Co. has reduced prices on some of its fall goods.

The mild winter has left many retailers overstocked with heavy clothing and very low prices on such goods are being advertised. Activity later on is prophesied but there is no denying that the distributive demand during January has been disappointing or that business men in the Northwest are somewhat disturbed by the number of bank failures recently reported in that section.

In England the hysterical fear of the labor government appears to be somewhat allayed and the railroad strike is settled. In Germany the hope of a gold bank is a little more definite, and in France, Poincare seems to have become a litle more tractable after reading the plain words that Ramsay Macdonald intended for his ear.

Machinery Needs and the French Franc

Repairing the old army automobiles sold to Poland—Manufacturers busy with orders and depreciated franc an enigma to them—Citroën chassis for trucks

By A Paris Correspondent

COINCIDENT with the French anxiety over the recent floods is the growing uneasiness of the nation over the continued depreciation of the franc on the New York and London exchanges. It is incomprehensible to the French that with the industrial situation of France daily becoming more favorable through the balancing of the foreign trade and with the success that is attending the efforts of the government to balance the budget, the French franc should now be quoted in New York and London at the lowest point reached since the fall that began after the armistice. It is argued that rightfully the franc should be on the way to a substantial improvement and that the reverse indicates a campaign of speculation which, if not checked, will have a serious repercussion on the cost of living and will make necessary a readjustment of wages that will undoubtedly have a far-reaching effect on the state of business.

A meeting has taken place between the Minister of Finance and some of the leading French financiers to discuss the reasons for the continued fall in the value of French currency and to endeavor to take steps so far as possible to put an end to speculation in exchange on the French bourses.

It is greatly to be regretted from the standpoint of the possibility of machine tool imports from the United States that a further fall in the value of the franc should have taken place at this time, for with French industries well stocked with orders and faced with the necessity of increasing output to care for the growing business, considerable imports of machine tools could have been looked for. With, however, the dollar at francs 20.50 and every prospect of a further rise, it is little short of hopeless to expect that French manufacturers will be able to find the capital necessary to import new equipment from the United States. They will be forced to speed up their old equipment and to satisfy themselves with such used machinery as they can find in France.

Iron Production Gains

The production of iron and steel in France continues to increase. According to the statement of the Comité des Forges, three additional blast furnaces were blown in during the month of November, bringing the number in operation on Dec. 1 up to 119. There is no doubt that the output of steel during 1923 exceeded not only that of 1922, but that of 1913 as well, although the total production was only 52 per cent of the possible total production of the country inclusive of the Lorraine mills recovered from the Germans.

It is expected that French industries will benefit greatly from the business that will follow the credits recently granted the Polish, Roumanian and Tschecko-slovakian Governments for the purchase of military and railway equipment. These credits are to be utilized exclusively in France and will no doubt entail the delivery of a considerable amount of aviation material, automobile trucks, rails, rolling stock, etc. Already a commission has arrived in Paris from Poland and it is understood that this commission is instructed to purchase a considerable quantity of machine tools.

It will be recalled that shortly after the armistice the liquidation service of the American Army in France sold to the Polish Government, among other materials, a large number of Army automobile trucks of various makes. This material is in need of repairs and rather than bring parts from the United States at prices which are at present prohibitive on account of the low purchasing value of the Polish mark, several repair shops are to be equipped in Poland to make parts locally. The machinery needed for this work will without doubt have to be purchased in the United States and it is quite likely that this business will go to the Paris agents of American machine tool factories. There is every prospect that among the material to be bought in France by the three countries there will be a large amount of machinery, as both Poland and Roumania in particular are in urgent need of machine tools. Therefore, the credits granted by France should prove of direct benefit to American manufacturers.

> "Even the truck builders who were hard hit by the great quantity of trucks released by the armies after the armistice are profiting by the general improvement and one of them is arranging to double his output. There is a considerable demand for light delivery trucks brought about by the increasing traffic in the city's streets, which is making it difficult for bicycle and tricycle messengers to circulate."

In the automobile branch it is reported that manufacturers are quoting three to four months delivery on cars and that the demand for small cars continues heavy in spite of what is usually the off season. Apparently the past few months of rain have not deterred buyers from acquiring cars and most of the large builders express themselves as highly satisfied with the outlook for this year.

Even the truck builders who were hard hit by the great quantity of trucks released by the armies after the armistic are profiting by the general improvement and one of them is arranging to double his output. There is a considerable demand for light delivery trucks with a capacity of 500 to 1000 lb. brought about by the increasing traffic in the city's streets, which is making it difficult for bicycle and tricycle messengers to circulate on account of the danger. Large numbers of these small trucks mounted on light Citroën 5 hp. chassis are already used by the perfumers, confectioners, pharmacists, department stores, etc.

Prof. Thomson Awarded Kelvin Medal

Prof. Elihu Thomson, one of the founders of the General Electric Co., and among the world's most eminent electrical engineers, has been awarded the Lord Kelvin gold medal and will go to England during the coming summer receiving the medal on July 11.

The award was made by British and American Engineering Societies acting jointly. It is awarded every three years as a mark of distinction and for excellence in original research work in engineering. Prof. Thomson is the first American to receive this honor.

Professor Thomson became professor of chemistry and physics in the Central High School in Philadelphia in 1876. Being interested in electricity, he began work in dynamo and electric lighting development while teaching. The result of the work was the establishment of the American Electric Co. in New Britain, Conn.

Prof. Thomson has been granted about seven hundred patents in the United States. His inventions in dynamo electric machinery, electric welding, watt-hour meters, lightning arresters and magnetic arc extinguishers are fundamental. He was a pioneer in arc lighting and innumerable electrical devices have been improved through his work.

He has received the honorary degree of Master of Arts from Yale; of Doctor of Philosophy from Tufts, and of Doctor of Science from Harvard, and has been decorated as a Chevalier et Officier of the Legion D'Honneur of France. For his achievements in the electrical field he was awarded the Grand Prize at the Paris Expositions in 1889 and 1900 and the St. Louis Exposition of 1904. He was president of the American Institute of Electrical Engineers in 1889 and the first recipient of the famous Edison Medal. He has been awarded the John Fritz medal of the four national engineering societies, the Hughes medal of the Royal Society of London, the Rumford medal, the Eliott Cresson gold medal by the Franklin Institute, and twice received the John Scott Legacy medal for electrical inventions.

Interesting Exhibits at Auto Show

The 23rd annual Detroit automobile show ran from Jan. 19 to 26 inclusive, including Sunday and was held in Convention Hall, a one-floor building containing 180,000 sq.ft. of exhibition space. There were 329 passenger cars and 87 commercial cars shown; together with 110 automotive equipment exhibits. The passenger car prices ran from $265 for the Ford runabout to $14,500 for the Rolls-Royce phaeton. The lowest priced commercial car was $370 and the highest priced, a large passenger carrying bus, $7,500. The exhibit contained several new cars and trucks, while a few have returned after missing one or more shows. A few of the cars formerly shown are now numbered among the missing.

The Society of Automotive Engineers annual convention was also held in Detroit for the first time at the General Motors Bldg. on the Grand Boulevard. This, combined with the Automobile Show made an extra demand on the hotels, resulting in everything being filled to capacity—or over.

The exhibition of machine tools in the laboratory section of the General Motors Building attracted considerable attention. It was entirely a grinding machine exhibit, the three companies represented being the American Grinder Co. of Detroit, the Heald Machine Co. and the Norton Co., both of Worcester. The first named had a gear tooth grinder in operation, while the others had the latest machines in their respective lines. All were working exhibits in charge of thoroughly competent representatives.

Personals

L. D. ALBIN, sales manager of the Ingersoll-Rand Co., New York City, sailed on the Paris, Feb. 6 for a year's business trip abroad.

H. E. GALVIN, second vice-president and manager of the Buffalo office of the Ogden R. Adams Co., Inc., has resigned and has become associated with the Buffalo office of Crane-Schiefer-Owens, Inc., as a sales engineer.

JAMES H. FOSTER, formerly president of the Hydraulic Steel Co., Cleveland, and associate companies, has resigned from active management to engage in other enterprises.

C. M. BUNNELL, formerly general sales manager of the Torrington Co., Torrington, Conn., has joined the Pyrene Manufacturing Co., in charge of sales in the chain department.

W. B. JAMESON, for the last twenty years identified with the automotive industry, and more recently with the Earl Motors, Inc., at Jackson, Mich., has been appointed manager of manufacturing in the East side plants of the Hydraulic Steel Co., Cleveland.

CLAYTON R. BURT, vice-president of the Austin Machinery Corp., Chicago, has been elected president, succeeding A. B. LINDEMAN, who has resigned, but who will continue as a stockholder.

HAROLD ABER has been appointed assistant general manager of the new Detroit territory of the Shepard Electric Crane & Hoist Co., New York City.

CHARLES CURTIS of Chicago has been appointed sales manager of the Western Iron Stores, Inc., Milwaukee, Wis., succeeding J. W. HORNE, resigned.

V. C. PAGE has joined the Motor Products Corp., Detroit, Mich., to direct the development of a new motor accessories division.

ROBERT W. REID has resigned as the director of sales of the Taft-Peirce Manufacturing Co., Woonsocket, R. I., and has accepted the position of general manager of the Pressed Metal Co., Pawtucket, R. I.

J. D. GILLETTE is the district manager of the Shepard Electric Crane & Hoist Co., New York City, in the Detroit territory. His headquarters will be in the General Motors Building.

WALTER F. DIXON, works manager of the Elizabethport plant of the Singer Manufacturing Co., has been appointed secretary of the Machine Shop Practice division of the A.S.M.E. He succeeds K. H. CONDIT, Editor of the *American Machinist*, who gave up the position to become a member of the publication committee of the society.

WILLIAM L. NEILSON, vice-president and general sales manager of the Norton Co., Worcester, Mass., is making a tour of Europe on business.

L. A. DOWNS has been elected president of the Central of Georgia Railway, succeeding W. A. WINBURN, who died recently. Mr. Downs was formerly vice-president.

PORTER ALLEN has been appointed superintendent of the Norfolk division of the Pennsylvania Railroad System, succeeding M. D. PITCAIRN, who has been made supervising engineer of maintenance of way on the Buffalo division.

CLARENCE A. EARL has resigned as head of the National Motors Corp. and the National Motors, Inc., Indianapolis, Ind.

H. W. TOWNSEND, formerly general superintendent of the Aldrich Pump Co., Allentown, Pa., is now district sales manager for the same company with headquarters at Tulsa, Okla.

J. A. SHEEDY has been appointed master mechanic of the Meadows shops in New Jersey of the Pennsylvania Railroad System. Mr. Sheedy was formerly assistant engineer of motive power in the Wilmington division.

HOWARD J. SNOWDEN is now in the Pittsburgh office of the Baldwin Locomotive Works, having formerly been in the Mexican office.

C. E. DAVIES, formerly assistant general manager in charge of electrical engineering, plant work and railway service, Canadian National Railways, has been appointed acting general manager of the C. N. R. telegraphs and telephones to succeed the late G. C. JONES.

CLYDE WISENBURGH has joined the sales organization of the U. S. Ball Bearing Manufacturing Co., Chicago, Ill. He was formerly sales representative with the Standard Bearings & Equipment Co.

T. MUELLER, president of the Mueller Metals, Ltd., Port Huron, Mich., addressed the Sarnia, Ontario, Chamber of Commerce recently. He stated that Canada would see a greater influx of manufacturers from the United States within the next ten years, than in all previous time.

JONATHAN WARNER, president of the Trumbull Steel Co., Warren, Ohio, has been named a director of the American Iron and Steel Institute.

LESLIE EDGCOMB is the president of the newly organized Edgcomb Steel Co., Philadelphia. W. H. FRANKLIN and HARRY EDGCOMB are associated with him.

Obituaries

GEORGE L. MEADE, manager of the Pittsburgh office of the Pawling & Harnischfeger Co., Milwaukee, died suddenly in Pittsburgh Jan. 25. He had been with the Pittsburgh office of the company for the past eighteen years and previous to that was in the Columbus, Ohio, office. Death was due to heart disease.

SIDNEY ROSENFELD, vice-president of the Grabler Manufacturing Co., Cleveland, died at his home in that city Jan. 28. He was one of the founders of the company 25 years ago. He was 50 years old.

DANIEL M. BUCK, metallurgical engineer of the American Sheet & Tin Plate Co., Pittsburgh, Pa., died recently in that city. He was well known in engineering societies.

Business Items

The Link-Belt Co., Chicago, announces that the price of the portable belt conveyor equipped with a two or three phase 60 cycle motor and fitted with the underneath raising and lowering mechanism that is made by this company, has been reduced to $485.

The Crane Manufacturing Co., Bristol, Conn., has purchased the Pequabuck Bottling Works. James Crane, president of the company, announces that production will commence as soon as new machinery can be installed and necessary adjustments made. The company manufactures bolts.

The Standard Turbine Corp., Scio, N. Y., manufacturer of steam turbines, announces the opening of its San Francisco office, the representatives in that city being Halloran & Golcher, machinery representatives.

A new company incorporated by Peter A. Mortenson, Walter E. Smith and Rose B. Harter has taken over the assets of the Albaugh-Dover Co., Chicago. The company will be known as the Albaugh-Dover Manufacturing Co. and is capitalized for $200,000.

The plant of the L. H. Goodnow Foundry Co., Fitchburg, Mass., was partially destroyed by fire Jan. 27. The estimated amount of damage resulting was placed at $40,000. The machine department and the pattern department will have to be entirely rebuilt.

The consolidation of the Mianus Motor Works and the Mianus Diesel Engine Co., two Stamford, Conn., concerns, has been confirmed. Franklin S. Jerome, Seymour, Conn., head of the new organization, declared the merger would mean a larger production.

Officials of the Pawling & Harnischfeger Co., Milwaukee, tendered a banquet on Jan. 26 to 250 of its employees who have been in the service five years or longer. Gold service badges were presented to each, special diamond-studded pins being distributed among all with 25 and 30 years' service to their credit. A permanent employees' organization will be formed to preserve veteran traditions.

The Standard Turbine Corp., Scio, N. Y., announces the opening of its Omaha office, the representative being the Industrial Sales & Engineering Co.

James A. Woods, president of the Bridgeport Machine Co., has estimated the profits of that corporation for 1923 at approximately $250,000, against $425,999 in 1922. Net profits for the four years from 1919 to 1922, inclusive, averaged $310,419. Mr. Woods said the outlook for manufacturers of oil-drilling machinery was bright.

The American Steel & Wire Co., Worcester, Mass., in connection with the celebration of its twenty-fifth anniversary, announces work will soon start on the new addition to the electric cable plant at the south works. The new plant will be 800x60 ft., of brick and steel construction to cost $500,000.

At the annual meeting of the Topp-Stewart Tractor Co., Clintonville, Wis., it was decided to reinstate regular production and resume merchandising to take advantage of the more favorable market possibilities that have recently appeared and are improving. A crew is being assembled to report Feb. 1, when the plant will be re-opened on a moderate output scale.

The Simplicity Engine & Manufacturing Co., Port Washington, Wis., has changed its corporate name to Simplicity Manufacturing Co. The capital stock at the same time was increased from $75,000 to $100,000.

The annual meeting of the Mill & Mine Supply Co. was held at the office of the company, 211-215 South Broadway, Akron, Ohio, Tuesday afternoon, Jan. 22, 1924. Officers of the company reported a good year for 1923, and prospects for 1924 business greater than at any time since the spring of 1920. Dividends of 8 per cent were paid on the preferred issue for the year just ended. The following officers and directors were elected: W. W. Sharp, president; M. A. Knight, vice-president; Fred Good, secretary; Chris Franz, treasurer. Wm. O'Neil, Wm. Boesche, Alexander Adamson, G. A. Rohner, A. G. Teeple and the officers form the board of directors.

Group Insurance for Gear Works Workers

More than 150 employees of the Philadelphia Gear Works, Philadelphia, have joined with their employer in having their lives insured under a "group insurance" plan which has just been arranged between George L. Markland, Jr., president, and the Metropolitan Life Insurance Co. of New York. Employer and employee share the cost.

The program adopted includes life insurance ranging from $1,000 to $2,500, according to the class of work. And in addition there is provided a benefit of $12 a week for accidents outside the plant or for illness, accidents occuring while at work being handled under the Pennsylvania Workmen's Compensation Law at the expense of the company.

MR. MARKLAND'S REMARKS

In an announcement to his employees, Mr. Markland said in part:

"It is the first duty of earners to provide for those dependent upon them. Realizing this, and being desirous of encouraging the utmost protection for your families, we have decided on the above plan, believing that it will be helpful to all those entitled to this insurance. It is not the desire of the company that this insurance shall in any way take the place of any insurance you may be carrying . . . or contemplate taking out in the future. It is hoped that this will merely serve as additional insurance and will be a means of encouraging larger and more adequate protection to those dependent upon you."

New employees are eligible to the insurance after they have worked six months.

Provision is made that if any employee, while insured, becomes totally and permanently disabled before reaching the age of 60, he will receive the full amount of insurance in monthly installments of $51 for 20 months. The employees also have available the visiting nurse service of the Metropolitan as well as an extensive better health publication service.

Pamphlets Received

Proceedings of the Women's Industrial Conference. Department of Labor, Government Printing Office, Washington, D. C. This is a bulletin from the women's bureau of Department of Labor and is numbered 33. The conference was held Jan. 11, 12 and 13, 1923, at Washington. All speeches, papers and resolutions are contained in the pamphlet.

Practical Steps Which Should Be Taken to Improve Our National Transportation System. Samuel Rea. United States Chamber of Commerce, Washington, D. C. This is the speech that was delivered by Mr. Rea, president of the Pennsylvania Railroad System at the Eastern Division meeting of the Chamber of Commerce of the United States of America on Jan. 17. The speech is generally considered to be one of the best statement of facts concerning the railroads' conditions and prospects that has been made in some time.

Some Considerations of the Selection of Material and Heat Treatment of Tools. A. R. Page. The Automatic & Electric Furnaces, Ltd., 173-175 Farringdon Rd., London, E. C. 1.

This is a heat treatment bulletin that is published by this English company in the interest of heat treating by electric furnaces.

Trade Catalogs

Alloys for Electrical Resistance. The Driver-Harris Co., Harrison, N. J. Catalog R-24 contains charts, tables and specifications showing the advantages of the compan's product, Nichrome. The entire catalog makes an excellent reference book.

Cupolas. The Whiting Corp., Harvey, Ill. Cupola Catalog No. 171 has been issued as of November, 1923, and contains descriptive data on the Whiting Cupola with illustrations, cross sectional drawings, layouts and other valuable matter for the foundryman. The catalog is perforated on the left hand side making it handy for filing.

Export Opportunities

Th Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile body builders supplies. Sydney, Australia. Agency. Reference No. 8949.

Motor Accessories. Sydney, Australia. Agency. Reference No. 8949.

Barites washing and grinding machinery and utensils. Barcelona, Spain. Purchase. Reference No. 8979.

Marine engineering requisites. Wellington, New Zealand. Purchase and agency. Reference No. 8967.

Hydraulic machinery. Paris, France. Agency. Reference No. 8998.

Machinery and tools. Winnipeg, Canada. Agency. Reference No. 8945.

Machinery. Bordeaux, France. Agency. Reference No. 8995.

Machine tools. Paris, France. Purchase and agency. Reference No. 8975.

Forthcoming Meetings

American Gear Manufacturers Association. Spring Meeting. April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

American Society of Mechanical Engineers. Spring meeting. Cleveland, Ohio. May 19, 20, 21 and 22. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924. Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Division V. Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924. V. R. Hawthorne, secretary, 431 S. Dearborn St., Chicago, Ill.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

The Lyons Fair. Lyons, France. March 3 to 17, 1924. Information furnished by Emile Garden, 50 Church St., New York City.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4,600 Prospect Ave., Cleveland, Ohio.

New and Enlarged Shops

Machine Tools Wanted

Calif., Los Angeles—Atchison, Topeka & Sante Fe Ry., Kerckhoff Bldg., W. M. Catlin, Purch. Agt.—equipment for proposed car and locomotive shops at Cleburne, Tex., for the Grand Canyon Ry.

Kan., Baxter Springs—Baxter Machine & Tool Co., G. Lurwick, Purch. Agt.—hollow spindle lathe, taper attachment, 6 in. hole; break to handle 10 gage iron.

Kan., Columbus—J. H. Mason—lathe, grinder, boring and burning in stand for garage and repair shop.

Mass., Boston—Stafford Co., 1715 Hyde Park Ave. (manufacturer of mill machinery)—large and small lathe, upright drill, planer, hacksaw, shafting, pulleys, belting, reamers, punches, small tools and possibly shaper for proposed machine shop.

Mass., Waltham (Branch of Boston)—W. D. Clement, 129 Beacon St. (machine shop)—bench lathe, 12 in. swing, 5 ft. long; engine lathe, 24 in. swing, 10 ft. long; radial drill (used.)

O., Cincinnati—Warner Elevator Mfg. Co., 2613-31 Spring Grove Ave.—thread miller for cutting worms up to 9 in. diameter.

Pa., Pittsburgh—Anchor Drawn Steel Co., 1101 Farmers Bank Bldg. (high speed and carbon steel)—shear (double bar), straightener, centerless grinder, K. & R. foot shear, baking furnace, 1½ ton monorail crane, etc., for new plant at Latrobe.

Pa., Pittsburgh—Bd. Educ., Fulton Bldg.—eleven lathes, one shaper and other equipment for Peabody High School.

Wis., Baraboo—Muellers Garage, H. H. Mueller, Purch. Agt.—tool room lathe, emery wheel and air tank.

Wis., Milwaukee—A. Kopperud Co., 36th Ave. and Lapham St. (machinist)—medium duty forge, emery wheel, stand and drill press.

Wis., Watertown—Breuer & Stone, Inc., 100 West Milwaukee St.—machine tools and equipment for proposed $50,000 factory for the manufacture of rotary printers.

Ont., Brantford—Martins Garage—complete equipment for repair shop, to replace that which was destroyed by fire.

Que., Montreal—Canada Metal Co., Ltd., 3050 Hutcheson St., D. L. Scott, Purch. Agt.—machinery and equipment to replace $40,000 fire loss.

Que., Sherbrooke—L. St. Laurent, 126 King St. W.—small lathe, drill press and emery wheel for garage.

Machinery Wanted

Calif., Lankershim—Lankershim Ice Co., 5410 Lankershim Bldg.—equipment for proposed addition to ice plant.

Calif., Visalia—Acme Ice Cream Co., S. R. Greenfield, Mgr.—equipment for proposed ice cream plant.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of Panama Canal—receiving bids until Feb. 9 for iron, steel, circular saws, etc.

Kan., Baxter Springs—J. H. Auto Supply Co., R. B. Page, Purch. Agt.—combined compressor, buffer, pump and motor.

Kan., Baxter Springs—J. Higginbotham (blacksmith shop and wagon works)—combination woodworking machine.

Kan., Baxter Springs—J. Runnell (machine shop)—electric drill, capacity about ⅞ to 1¼ in.

Mass., Boston—The city, J. A. Rourke, City Hall, Comn. Pub. Wks.—wood and metal working tools for proposed Washington School in Belmont Dist.

Mass., Boston—Union Spinning & Plating Co., Inc., 67 Sudbury St.—sheet metal workers bar, 24 to 36 in. long, also one crimping machine.

Minn., Minneapolis—Juckem Co., 215 8th St., S., E. J. Juckem, Pres.—woodworking machinery, enameling oven, etc. for proposed $50,000 factory for the manufacture of automobile bodies, tops, curtains, etc.

N. Y., Buffalo—Post Michael Co., 25 East Huron St. (printer and engraver) metal jig saw, also polishing stand and lathe.

Pa., Phila.—La France Textile Co., 4423 Frankford St., J. B. Brady, Purch. Agt.—machinery for the manufacture of cotton and woolen goods at Woodstock, Ont.

Tenn., Nashville — City, H. E. House, Mayor—electric conveyors for proposed $400,000 garage.

Wis., Arpin—Milk Products Co., E. C. Brown, Purch. Agt.—condensing machinery and separators, belt driven.

Wis., Eau Claire—Sanitary Dairy Co., 522 Water St., M. P. Vecke, Purch. Agt.—refrigeration machinery, motor driven.

Wis., Hales Corners—School Bd., G. W. Shields, Clk.—manual training machinery and equipment, including wood turning, bandsaw, etc.

Wis., Milwaukee—Craftsmen's Press, Inc., c/o J. J. Korbel, 411 Cambridge Ave.—rotary press and lithographing outfit.

Wis., Milwaukee—I. W. Downing & Son, 224 4th St. (manufacturer of pumps, etc.) 75 ton ammonia compressor, steam driven, also 50 ton shell brine cooler.

Wis., Milwaukee—J. Kern, 378 Washington St. (garage)—large size air compressor, gasoline storage tanks, pumps and oil extractor.

Wis., Milwaukee—Monarch Press, 129 Michigan St.—large cylinder press.

Wis., Milwaukee—Quality Press, 373 Mitchell St.—paper cutting machine and rotary press.

B. C., Vancouver—Harbor Comrs., 712 Pender St., W.,—equipment for proposed coal bunkers.

Ont., Orillia—Canada Wood Specialty Co., Ltd., W. D. Mott, Mgr.—sawmill and woodworking equipment.

Que., Fassett—Fassett Lumber Corp., Ltd., S. J. Stamforth, Purch. Agt.—saw and shingle mill equipment.

Que., Montreal—Huron Leather Co., Ltd., c/o C. R. McKenzie, 145 St. James St.—tanning equipment.

Que., Plessisville—Guay, Savoie & Cie., J. A. Savoie, Purch. Agt.—additional foundry equipment, molds, press, etc.

Que., Sherbrooke—Hawkins Bros., Lansdowne Ave. (welding)—grinder.

Que., Windsor—M. Pye, Main St.—bottling equipment.

Metal Working Shops

Ala., Montgomery—The Atlantic Coast Line Ry., A. C. L. Bldg., Wilmington, N. C., awarded the contract for the construction of car and engine shops, etc., to replace those which were recently destroyed by fire.

Calif., Glendale—The Kelly-Kline Motor Co., 230 North Brand St., is having plans prepared for the construction of a 1 story, 50 x 135 ft. garage. A. G. Bailey, Junior Orpheum Bldg., Los Angeles, Archt.

Calif., Hanford—The Hanford Union High School Dist., G. W. Armstead, Clk., will receive bids until Feb. 11 for the construction of 1 story machine shops for school. Coates & Travers, Rowell Bldg., Fresno, Archts. Noted Dec. 27.

Calif., Long Beach—F. Hoffman, 2nd and Bennett Sts., awarded the contract for the construction of a 1 story, 90 x 120 ft. garage on Anaheim Rd.

Calif., Long Beach—H. S. Wright, 1740 Lewis St., awarded the contract for the construction of a 2 story, 50 x 150 ft. garage on American Ave. Noted Jan. 3.

Calif., Los Angeles—The Adams-Campbell Co., 1724 South Los Angeles St., awarded the contract for the construction of a 2 story, 30 x 110 ft. machine shop.

Calif., Los Angeles—The Cain Gas Radiator Co., 5215 Moneta Ave., will build a 1 story, 75 x 200 ft. factory.

Calif., Los Angeles—The Detwiler Mfg. Co., 1335 Santa Fe Ave., will build a 1 story, 40 x 100 ft. boiler plant.

Calif., Los Angeles—I. Eisner, 1114 South Los Angeles St., will build a 1 story, 90 x 120 ft. garage on Westminster Pl.

Calif., Los Angeles—R. P. Flanders, 743 Wall St., awarded the contract for the construction of a 1 story, 35 x 115 ft. garage on Towne Ave.

Calif., Los Angeles—H. R. Hay, 951 South Grattan St., awarded the contract for the construction of a 1 story, 45 x 130 ft. garage on West Slauson Ave.

Calif., Los Angeles—The Hoyt Heater Co., 2838 East 2nd St., awarded the contract for the construction of a 1 story, 70 x 200 ft. factory on 25th St. Estimated cost $42,000. Noted Dec. 27.

Calif., Los Angeles—The Marbelite Corp., c/o Brombacher Iron Wks., Contr., 1662 Long Beach Ave., awarded the contract for the construction of a 1 story, 50 x 150 ft. machine shop.

Calif., Los Angeles—The Master Service Co., 1510 West 8th St., awarded the contract for the construction of a 1 story, 50 x 213 ft. garage on South Hoover St.

Calif., Los Angeles—The J. A. Nadeau Co., 1100 East Slauson Ave., awarded the contract for the construction of a 1 story, 80 x 100 ft. addition to garage. Noted Jan. 3.

Calif., Los Angeles—W. Shortsleeve, et al., 810 South Grand Ave., is having plans prepared for the construction of an 8 story, 60 x 160 ft. garage. Curlett & Beelman, Union Bank Bldg., Archts.

Calif., Los Angeles— F. M. Simpson, Citizens Natl. Bank Bldg., will build a 1 story, 100 x 110 ft. garage on Crocker St.

Calif., Los Angeles—S. W. Smith Co., Inc., 1620 South Figueroa St., awarded the contract for the construction of a 1 story, 145 x 150 ft. garage on Gordon St. Noted Jan. 3.

Calif., Los Angeles—The Standard Welding & Mfg. Co., 1146 South Los Angeles St., awarded the contract for the construction of a 1 story, 50 x 115 ft. factory.

Calif., Los Angeles—J. Zoebelien, c/o S. Fossler, Archt., 1616 Cahuenga Ave., has had plans prepared for the construction of a 1 story, 50 x 140 ft. garage and salesroom on 38th St. and Moneta Ave.

Calif., San Francisco—J. Palaprat, c/o O'Brien Bros., Inc., Archts., 315 Montgomery St., is receiving bids for the construction of a 1 story garage on 18th St. near Sanchez St. Estimated cost $40,000.

Calif., Santa Monica—A. P. Creel, 717 Santa Monica Blvd., awarded the contract for the construction of a 1 story, 90 x 100 ft. garage on 4th Ave.

Conn., New Britain—The Amer. Hardware Corp., Franklin Sq., awarded the contract for the construction of 6 story, 60 x 140 ft. Russell and Erwin plant. Estimated cost $175,000.

Fla., Bowden (Phillips P. O.) — The Florida East Coast Ry., St. Augustine, H. N. Rodenbaugh, Genl. Mgr., plans to build a large shop, etc., here, to replace present facilities at South Jacksonville. W. G. Brown, Engr. M. W.

Kan., Baxter (Baxter Springs P. O.)—B. Quapaw, Baxter Springs, awarded the contract for the construction of a 1 story, 100 x 128 ft. garage, here. Estimated cost $20,000.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Heavy melting steel scrap scarce. Basic pig iron higher. Iron prices firmer generally. Small demand for light steel rails; prices losing firmness. Bars, $2.40; plates and shapes, $2.50 per 100 lb. Pittsburgh. Despite recent heavy buying of fabricated structural steel, quotations of $2.35@$2.40 per 100 lb. have been reported, on exceptional tonnages, at Pittsburgh mills.

Advances—Tin and antimony markets stronger; prices tending upward. Zinc firm at present levels; price 5c. per 100 lb. higher than week ago in New York warehouses. Aluminum ingots up 2c.; solder, 2c. and antimony, 1½c. per lb. in Cleveland. Lard cutting oil advanced 3c. per gal.; red and white lead, ¼c. per lb. in New York, during week. Coke prices rising.

Declines—Electrolytic copper demand slightly lessened; price down ¼c. per lb. in New York. Lead market softening with drop in demand for prompt metal.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	4.50@4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	3.00	4.34	3.75	4.00
No. 12	3.10	4.39	3.80	4.05
No. 14	3.20	4.44	3.85	4.10
No. 16	3.40	4.54	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.55	4.45	4.70
Nos. 22 and 24	3.75	4.60	4.50	4.70
Nos. 25 and 26	3.80	4.65	4.55	4.75
No. 28	3.85	4.75	4.65	4.85
Galvanized				
Nos. 10 and 11	4.00	4.80	4.70	4.85
Nos. 12 and 14	4.10	4.90	4.80	4.95
Nos. 17 and 21	4.40	5.20	5.10	5.24
Nos. 22 and 24	4.55	5.35	5.25	5.40
No. 26	4.70	5.45	5.50	5.55
No. 28	5.00	5.75	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	3.90	4.30
Cold drawn flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	.....	.....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.37½
Tin, 5-ton lots, New York			50.50
Lead (up to carlots), St. Louis	8.12½	New York	8.62½
Zinc (up to carlots), St. Louis	6.55	New York	7.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	29.00	28.50
Antimony (Chinese), ton spot	11.50	13.00	10.25
Copper sheets, base	20.50	20.75	23.00
Copper wire, base	16.00	18.50	16.25
Copper bars, base	19.50	22.00	19.50
Copper tubing, base	22.50	26.75	23.00
Brass sheets, base	17.25	21.50	18.75
Brass tubing, base	21.50	26.50	20.50
Brass rods, base	15.00	17.50	15.75
Brass wire, base	17.75	21.50	.....
Zinc sheets (casks)	10.50	10.45	.....
Solder (½ and ½), (case lots)	34.75	33.75	30.00
Babbitt metal (83% tin)	52.00	61.00	48@52
Babbitt metal (35% tin)	25.00	20.50	22@25
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.37½	10.75	11.50
Copper, heavy, and wire	9.87½	10.25	10.75
Copper, light, and bottoms	7.87½	8.50	9.75
Lead, heavy	5.75	6.50	6.00
Lead, tea	3.87½	4.00	5.00
Brass, heavy, yellow	5.25	.. ..	7.25
Brass, heavy, red	7.00	9.25	9.00
Brass, light	4.50	4.75	6.25
No. 1 yellow brass turnings	5.00	5.75	6.75
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.0
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.20	$0.14
Cotton waste, colored, per lb.	.09@.12½	.17	.10½
Wiping cloths, 13¼x13¼, per lb	10.50	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.	11.00	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.00	.94
Lard cutting oil, 25% lard, per gal.	.58	.50	.67½
Lard oil, pure, per gal, 2 to 5 bbl. lots	.80@1.35	1.01	.97
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.00@4.50
Coke, prompt foundry, Connellsville	per net ton		5.25@6.50
White lead, dry or in oil	100 lb. kegs		New York, 14.50
Red lead, dry	100 lb. kegs		New York, 14.50
Red lead, in oil	100 lb. kegs		New York, 16.00

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.044	0.044	0.039
Brass rods	per lb	0.15	0.155	0.17
Solder (½ and ½)	per lb.	0.3475	0.3375	0.29
Cotton waste	per lb.	.14@.21	.11@.14	0.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.50
Machine oil	per gal.	0.29	0.29	0.33
Belting, leather, medium	off list	40–2½%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	45%	45%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1½ and 1½x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	45%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	50%	50–5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	65%	.....	.....
Semi-finished nuts, ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.35	.....	0.15
½ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$3.70 base

Md., Baltimore—The Eastwick Motor Co., 120 West North Ave., awarded the contract for the construction of a 2 story, 150 x 165 ft. garage, salesroom and service station on Remington and 29th Sts. Estimated cost $100,000. Noted Jan. 31.

Mass., Boston—The Stafford Co., 1715 Hyde Park Ave., manufacturer of mill machinery, plans to build a 1 story, 40 x 80 ft. machine shop. Estimated cost $25,000, including equipment.

Mass., New Bedford—The Continental Wood Screw Co., Mt. Pleasant St., is having plans prepared for the construction of a 2 story, 80 x 100 ft. addition to screw plant. Estimated cost $50,000. Leary & Walker, Times Bldg., Engrs. and Archts. Noted Jan. 3.

Minn., Minneapolis—The Juckem Co., 215 8th St., S., manufacturer of automobile bodies, etc., is receiving bids and will open same about Feb. 15 for the construction of a 2 story, 60 x 165 ft. factory at 217 9th St., S. Estimated cost $50,000. E. J. Juckem, Pres. Liebenberg & Kaplan, 617 McKnight Bldg., Archts.

N. J., Camden—The Pennsylvania R.R., Broad St. Sta., Phila., awarded the contract for the construction of a 1 story, 86 x 156 ft. machine shop on Clinton St., here. Noted Dec. 27.

N. J., Newark—The James Ore Concentrator Co., 35 Runyon St., manufacturer of concentrating machinery, plans to build an experimental plant. Estimated cost $500,000. U. S. James, Purch. Agt.

N. Y., New York—The C. A. Cowen Co., c/o Kreymborg, Engr. and Archt., 2534 Marion Ave., will build a 2 story garage at 16 Convent Ave. Estimated cost $150,000.

N. Y., New York—J. Gerardi, c/o Jardin, Hill & Murdock, Archts., 50 East 42nd St., has had plans prepared for the construction of a 3 story garage on Lexington Ave. Estimated cost $175,000. C. J. Jeppesen, 49 West 45th St., Engr.

N. Y., New York—J. J. Tulley, c/o Margon & Glaser, Engrs. and Archts., 2806 3rd Ave., will build a 2 story, 100 x 250 ft. garage on Brook Ave. and 163rd St. Estimated cost $200,000.

N. Y., Schenectady—J. D. Picotte, 964 State St., is having plans prepared for the construction of a 3 story, 90 x 250 ft. garage on Erie St. Estimated cost $325,000. Goodman, Lowenberg & Bardback, Schenectady, Engrs. and Archts.

N. C., Charlotte—The Etheredge Motor Co. awarded the contract for the construction of a 2 story, 58 x 235 ft. garage on East 4th St. Estimated cost $80,000. Noted Aug. 16.

O., Dayton—The Duro Pump & Mfg. Co., 537 East Monument Ave., awarded the contract for the construction of a 4 story, 60 x 200 ft. factory on Amelia St. Estimated cost $175,000. Noted Jan. 3.

O., Springfield—The Wickham Piano Plate Co., 1817 Sheridan St., awarded the contract for the construction of a 1 story, 62 x 194 ft. foundry. Estimated cost $60,000.

Pa., Ambridge—The Central Tube Co., 1st Natl. Bank, Pittsburgh, will build a 1 and 3 story, 100 x 400 ft., 75 x 322 ft. and 100 x 150 ft. pipe mill and warehouse on 14th and Merchant Sts., here.

Pa., Ambridge—The Natl. Metal Moulding Co., will build a 1 story, 128 x 400 ft. factory.

Pa., Latrobe—The Anchor Drawn Steel Co., 1101 Farmers Bank Bldg., Pittsburgh, will build a 1 story, 80 x 250 ft. and 60 x 120 ft. plant, here. Estimated cost $250,000. Noted Jan. 31.

Pa., Manayunk (Phila. P. O.)—H. F. Righter, 4648 Umbria St., is having plans prepared for the construction of a 1 and 2 story, 50 x 91 ft. garage and service station. Estimated cost $40,000. F. V. Nichols, 15 South 21st St., Phila., Archt.

Pa., Phila.—S. W. Chapman, 3524 North 7th St., will build a 1 story, 62 x 64 ft. garage and service station on 5th and Bristol Sts. Estimated cost $30,000. Noted Jan. 3.

Pa., Phila.—B. Liebovitz is having plans prepared for the construction of a 1 and 2 story, 76 x 300 ft. and 50 x 300 ft. garage and service station on Ridge and Gerhardt Sts. Estimated cost $175,000. J. F. Canavan, 7032 Greenway St., Archt.

Tenn., Cleveland—C. L. Hardwick is having plans prepared for the construction of a 1 story foundry for the manufacture of stoves. Estimated cost $30,000. C. E. Bearden, 1st Natl. Bank, Chattanooga, Archt.

Tenn., Nashville—The city plans to build a 2 story, 150 x 750 ft. garage on 1st Ave. Estimated cost $400,000. H. E. House, Mayor.

Tex., Cleburne—The Grand Canyon Ry., operated by the Atchison, Topeka & Sante Fe Ry., Coast Lines, is having plans prepared for the construction of car and locomotive shops, etc., here. Estimated cost $3,000,000. R. B. Ball, Kerckhoff Bldg., Los Angeles, Ch. Engr. Coast Lines.

Tex., Dallas—The Ford Motor Co., Highland Park (Detroit P. O.), Mich., has had plans prepared for the construction of a 2 story, 150 x 200 ft. factory, etc. in Eastern Heights Dist., here. Estimated cost $1,000,000. A Kahn, 1000 Marquette Bldg., Detroit, Archt. Noted Oct. 4.

Tex., Jacksonville—The Texas & New Orleans R.R., operated by the Southern Pacific R.R., Southern Pacific Bldg., Houston, has had plans prepared for the construction of repair shops, roundhouses, etc., on a 32 acre site, here. H. M. Lull, Ch. Engr. Texas Lines.

Wash., Seattle—E. Wilson, Dexter Horton Bldg., is having plans prepared for the construction of a 6 story, garage, etc., on 2nd and Lenora Sts. Estimated cost $250,000. Engineer or architect not announced.

W. Va., Weston—The Danzer Mfg. & Supply Co., manufacturer of mine and oil well supplies, etc., plans to build an addition to its plant. Estimated cost $50,000.

Wis., Sheboygan—The Jenkins Machine Co., 315 North 8th St., is having plans prepared for the construction of a 1 story, 40 x 60 ft. foundry and machine shop. Estimated cost $50,000. A. Stuedemann, Pres. E. A. Juul, Security Bldg., Archt.

Wis., Watertown—Breuer & Stone, Inc., 100 West Milwaukee St., plans to build a 1 story factory for the manufacture of rotary printers. Estimated cost $50,000. Engineer or architect not selected.

Ont., Brantford—Martins Garage plans to rebuild its repair shop which was destroyed by fire. Estimated cost $40,000.

Ont., Hamilton — The Hoover Suction Sweeper Co., Gage Ave., N., plans to build a 2 or 3 story addition to its factory. Estimated cost $250,000. Engineer or architect not selected.

Something *of* Interest!

Yes sir, in the *Searchlight Section* there is something of interest for every reader.

Watch the advertisements here. Any issue may hold just the opportunity you have been seeking, or one you would like to take advantage of.

On the other hand, if you have an opportunity to offer others in this field—equipment, employment, business, selling, etc.—you will find advertising it in the *Searchlight Section* the quick and efficient way to get the attention of interested persons

For Every Business Want

Think* "SEARCHLIGHT" *First

G-22